The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

CONTENTS

F. A. Pierson, D.D.S. ..... Frontispiece

ORIGINAL COMMUNICATIONS

Dental Anesthesia Induced by Local Refrigeration.
J. S. Restarski, D.D.S., M.D.S. 599

Thymol in Cavity Sterilization.
Herbert Ward Day, D.D.S. 605

A New Approach to the Treatment of Dry Socket.
Kenneth R. Elwell, B.D.S., D.D.S. 615

Root-Canal Therapy and the Use of Sulfonamides.
Norman Rosen, D.M.D. 622

Functional Occlusal Balance in the Construction of Artificial Dentures.
Emmett Beckley, D.D.S. 628

The Chemistry and Pharmacology of Sulfonamide Drugs.
John C. Krantz, Jr., Ph.D. 634

A Practical Approach to the Problem of Vincent's Infection in the Armed Services.
Fremont R. Brooks, D.D.S., and Walter A. Wilson, D.D.S. 640

Skeletal Fixation Splint in Mandibular Fractures as an Aid to Early Denture Construction.
F. A. Richison, D.D.S., and J. T. Kennedy, D.D.S. 646

Civilian Dentistry in War-Time.
Henry Klein, D.D.S., Sc.D. 648

A Dental Problem Concerning Flying Personnel.
Roy H. Kennon, D.D.S., and C. M. Osborn 662

"Prophylactic Orthodontics" and Children's Dentistry.
J. A. Salzmann, D.D.S. 667

EDITORIAL DEPARTMENT

Horace Wells Centenary Celebration 670
American Association of Dental Schools Twenty-First Annual Meeting 675
Death of Dr. C. Victor Vignes 677
Death of Dr. Stanley Clark 677

Bibliographical 677

ASSOCIATION ACTIVITIES

Fifth War Loan—War Service Committee—Bureau of Public Relations—Council on Dental Therapeutics—Council on Dental Health—Committee on Legislation—Research Commission—Correspondence ..... See Special Contents for Association Activities, page 679

Deaths 702

INCIDENTS OF PRACTICE

Dentition of Identical Twins. Louis R. Burman, A.M., D.D.S. 705
Fusion of Bicuspid and Molar. Horace Beemer, D.D.S. 706

Current Literature 707
Announcements 716

ADVERTISEMENTS

Index to Advertisements A-63
Classified Section A-56

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DENTAL ANESTHESIA INDUCED BY LOCAL REFRIGERATION

PRELIMINARY REPORT

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IN a study of refrigeration of local areas in animals, Allen[1] states that there is no evidence of harm to the tissues of a normal limb or tail at temperatures slightly above freezing, unless the low temperatures are continued for several days. Since it is also known that impulses may be blocked by cooling nerves, use of this method for inducing local dental anesthesia was suggested in 1937, by George Chaydeane, an air-conditioning engineer.

At that time, Mr. Chaydeane and Cmdr. A. P. Black, (MC-V[S]) USNR, conducted experiments on dogs, using small hollow metallic applicators held firmly against the gingival tissues opposite the root of the tooth, through which brine chilled to 33° F. was circulated by a small centrifugal pump. They found that dental anesthesia, as determined by the reaction of the animal to an electric pulp tester, was effected in less than a minute, and that on removal of the applicators after a maximum of ten minutes, normal sensation returned in one and one-half minutes. Gross deleterious effects upon the chilled tissue were not noted.

The applicators were then employed by a dentist on two volunteers. As in the dogs, anesthesia was attained, as shown by an electric pulp tester. Refrigeration was maintained for three minutes without gross damage to the tissues.

The present study is the result of Commander Black's suggestion that these initial findings warranted further investigation. The effectiveness of refrigeration as an anesthetic agent on human subjects was to be tested, if examination of the gingival and dental tissues of dogs exposed to prolonged refrigeration failed to exhibit gross or microscopic changes.

Although an electric pulp tester is useful as an indicator of pulp vitality, it is not entirely reliable in determining the passage of a stimulus through a tooth.

*Lieutenant commander (DC), USN.

The material in this article should be construed only as the personal opinion of the writer and not as representing the opinion of the Navy Department officially.

From Naval Medical Research Institute, National Naval Medical Center.

It was therefore decided that the efficiency of the anesthesia could be accurately determined only by drilling and filling the carious teeth of human beings.

APPARATUS

Refrigerating Unit.—A simple but efficient refrigerating unit was constructed for the experimental work on dogs. The unit consisted of two chambers (Fig. 1), the outer one accommodating a crushed ice and salt mixture, while the inner contained the refrigerant (water 65 per cent and ethyl alcohol 35 per cent), which was circulated by an electrically operated centrifugal pump.

A mixture of alcohol and water was used because it was necessary to maintain subzero temperatures in the inner chamber and coils, in order to obtain the desired temperatures (1 to 2° C.) in the gingival applicators.

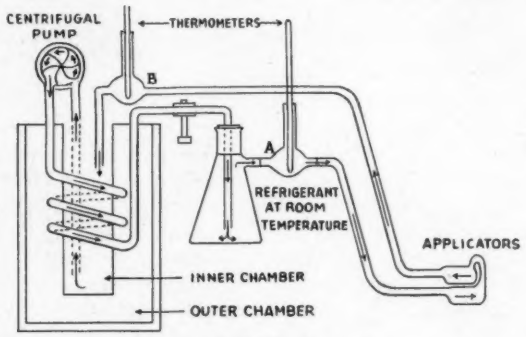


Fig. 1.—Refrigeration unit.

A thermometer (A, Fig. 1) provided an accurate check on the temperature of the circulating refrigerant before it entered the gingival applicators. With this arrangement, it was possible to maintain a temperature of approximately 2.0°C. at the applicators for two hours. A second thermometer (B) showed that a rise of 1 degree in temperature took place in the refrigerant during its circuit through the applicators.

The Gingival Applicators.—Two hollow metallic applicators were constructed of quarter inch diameter soft copper tubing. These were mounted in a holder (Fig. 2) which permitted placing the applicators firmly against the internal and external surfaces of the maxillae or mandible. Care was taken to effect proper contact of the applicators with the gingival surface throughout the experiments.

PROCEDURE

Ten dogs of various ages (4 months to about 5 years) were used in order to observe the reaction to refrigeration of young and older dental and gingival tissues.

The dogs were anesthetized with pentobarbital sodium by intraperitoneal injection of 0.5 cc. per kilogram of body weight. This dose kept the animals quiet for almost three hours. A rest period of at least two days was given each dog before repeating the experiment.

Temperatures between 1 and 2° C. were maintained for two-hour periods. As many as four experiments were carried out on the same animal. At no time was the temperature of the refrigerant reaching the applicators allowed to fall below 0° C. Both maxillary and mandibular jaw surfaces were used in the experiments. (Table 1.)

At the end of a series of experiments,

each dog was killed with ether and the whole head fixed by injection into the aorta of Ringer's solution followed by formol-Zenker's solution. The desired jaw sections were removed immediately and placed in jars containing formol-Zenker's solution to assure complete fixation of the specimens. This method of fixation was chosen in order to minimize postmortem tissue change. Decalcification was accomplished with 3 per cent hydrochloric acid in 80 per cent alcohol.

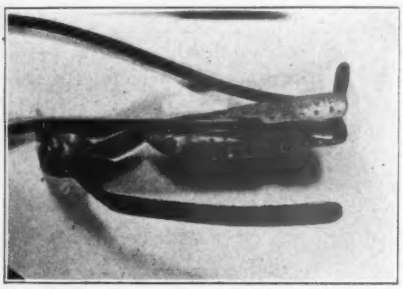


Fig. 2.—Applicator and holder used in dog experiments.

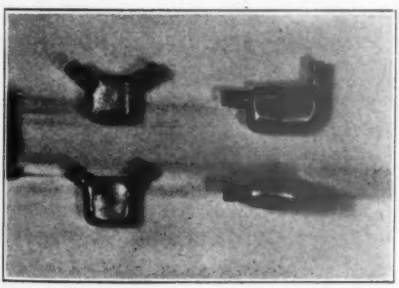


Fig. 3.—Applicator design for human subjects.

After decalcification, the blocks of jaw were embedded in celloidin, sectioned at 20-40° C. and stained with hematoxylin and eosin.

RESULTS

The first phase of the experimental work with dogs dealt with the effects of local refrigeration upon the cellular structure of the gingival and dental tissues. The experimental data are outlined in Table 1.

In no instance was any gross surface tissue change observed in either the maxillae or the mandible immediately after the removal of the applicators, after prolonged refrigeration.

Subsequent comparison of histologic sections from refrigerated areas with those from non-refrigerated control areas

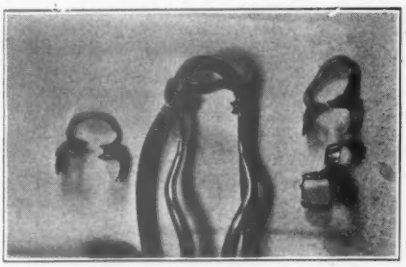


Fig. 4.—Modified rubber-dam clamps with spring extensions.

Fig. 5.—External view of applicator in molar position.

failed to show any difference in cellular structure of the gingival epithelium, gingival connective tissues, cortical bone, alveolar bone, blood vessels, nerves, periodontal membrane or dental pulp.

PRELIMINARY OBSERVATIONS WITH HUMAN SUBJECTS

The complete absence of cellular dam-

age to the dental and gingival tissues of dogs warranted study of the effectiveness of refrigeration as a means of anesthesia. For this purpose, it was decided to test the anesthetic effect of refrigeration during drilling and filling carious teeth of human subjects.

Apparatus.—Another set of hollow metallic applicators (Fig. 3) were constructed to fit the gingival tissues of the human mandible and maxillae. With these, it was found possible to gain access to all areas, with the exception of the mandibular third molar region.

Retention of the applicators in the proper gingival position was attained by the addition of flat spring extensions at the wings of standard rubber-dam clamps (Fig. 4). These extensions were made of thin phosphor-bronze and were contoured to overlap the internal and external aspects of the maxillae and mandible. The applicators fitted between the gingival tissue and the flat spring surface, thus assuring proper placement and firm contact with the oral mucosa (Figs. 5 to 7).

Abrupt changes in temperature at times caused moderately severe pain. This was true whether the temperature rose or fell. On discontinuing refrigeration, it was found that leaving the applicators in position for about two minutes after stopping the circulation of the refrigerant permitted sufficiently gradual warming to prevent pain. For starting refrigeration, it was necessary to devise a means of gradually lowering the temperature.

To this end, a container with the refrigerant at room temperature was placed in circuit between the refrigerating unit and the applicators (Fig. 1). With this arrangement, the solution at room temperature was gradually replaced by the cold refrigerant, this effecting a slow lowering of the temperature at the applicators. Pain was effectively prevented by this means.

An initial temperature of about 18° C. was comfortably tolerated. Thereafter, a temperature change of 5 to 6 degrees per minute could be tolerated with little or no discomfort. In some instances, a more rapid change was not uncomfortable.

The present refrigerating unit and gingival applicators fulfilled the requirements of our preliminary studies. However, it should be noted that considerable

Fig. 6.—Internal view of applicator in molar position.

Fig. 7.—Applicators in anterior mandibular and maxillary positions.

TABLE 1.—EXPERIMENTAL ANIMALS USED AND TIME OF REFRIGERATION*

Dog	Approximate Age	Refrigerated Area	Control Area	Duration of Refrigeration†
1	4 months	R. Mandible	L. Mandible	3-2
2	1 year	R. Mandible	L. Mandible	3-2
3	5 years	R. Maxilla	L. Maxilla	3-2
3	5 years	R. Mandible	L. Mandible	4-2
4	4 months	R. Mandible	L. Mandible‡	½
5	5 months	R. Mandible	L. Mandible	2-2
6	6 months	R. Mandible	L. Mandible	2-2
7	4 years	R. Mandible	L. Mandible	4-2
7	4 years	R. Maxilla	L. Maxilla	3-2
8	3 years	R. Mandible	L. Mandible	3-1.45
9	2 years	R. Maxilla	L. Maxilla	3-2
10	5 months	R. Maxilla	L. Maxilla	2-2

*The gross and microscopic findings revealed no evidence of tissue damage as the result of refrigeration for the stated times at 1.0-2.0° C.

†Each period.

‡Dog killed during experiment.

TABLE 2.—CAVITIES PREPARED FOR FILLING UNDER LOCAL REFRIGERATION

	Tooth No. and Preparation*	Age and Sex	Pain Sensation to Drilling Under Refrigeration	Approximate Time Required to Obtain Effective Anesthesia Min.	Approximate Duration of Refrigeration at 1.0-2.0 Degrees C. Min.
1	30-O	20 ♂	None	4	10
2	14-MO	20 ♂	None	3	12
3	15-O-O	20 ♂	None	3	7
4	19-DO	26 ♀	None	5	12
5	9-D	23 ♂	None	3½	5
6	10-D	23 ♂	Mild	4	6
7	4-O	19 ♀	Very mild	4	5
8	3-O	19 ♂	Very mild	4	7
9	3-O	19 ♂	None	4½	6
10	7-D	23 ♂	Very mild	4	5
11	3-MO	19 ♂	None	4	10
12	31-D	22 ♀	None	5	12
13	15-O	19 ♂	None	3½	12
14	3-O	19 ♂	None	4	9
15	8-M	20 ♂	Very mild	3	8
16	9-M	20 ♂	Very mild	3	7
17	31-O	22 ♀	None	5	8
18	6-E	21 ♂	None	4	5
19	23-D	23 ♂	None	4	4
20	26-D	23 ♂	None	4	4
21	6-E	22 ♂	Mild	5	5
22	5-MO	19 ♂	None	4½	6

*O, occlusal; M, mesial; D, distal; E, external.

experimentation is still needed before an efficient unit can be produced.

Procedure.—All the cavity preparations were begun without refrigeration, and drilling was continued until a definite sensation of pain was experienced by the patient, in order to present an adequate control period. Once the presence of pain was clearly established, the applicators were placed in position in the

gingival root area of the tooth and refrigeration was begun. When refrigeration had been in progress for from three to five minutes, preparation of the cavity was resumed.

The major portion of the drilling of the cavity was now completed. It was during this portion of the drilling that observations on the degree of anesthesia were made. Little or no sensation of pain was experienced by the patient. The applicators were then removed and enough time was allowed for normal sensation to return. Drilling of the cavity was again resumed. Since pain may diminish or even disappear during preparation of a cavity, only those cases in which pain on drilling recurred after refrigeration was discontinued were included in this study. Thus, a definite sensation of pain was experienced in each case used for demonstration of anesthesia, both before and after refrigeration. In one instance, evidence of mandibular conduction anesthesia was noted in the second bicuspid while the applicators were in the second molar position.

Excessive salivation during the cavity preparation was effectively controlled with cotton rolls and an aspirator.

Results.—To date, twenty-two cavities, in the teeth of sixteen enlisted men and women, have been prepared for filling under local refrigeration at 1.0—2.0° C. In fifteen instances, complete anesthesia was obtained, while in seven only mild pain was experienced (Table 2).

So far, no untoward effects have been observed as following the local refrigeration of gingival tissues in the maxillae or mandible. Daily checkups extending over a period of one week or longer after treatment have disclosed an absence of any gross change in the gingivae or teeth of human subjects.

SUMMARY AND CONCLUSIONS

1. Histologic investigation of canine jaw tissues subjected to continuous local refrigeration at 1.0-2.0° C. for as long as two hours disclosed no pathologic cellular changes.

2. Twenty-two cavities were prepared for filling under local refrigeration at 1.0-2.0° C. in the teeth of sixteen enlisted persons. In fifteen instances, complete anesthesia was obtained, while in seven a mild degree of pain was experienced.

3. These preliminary findings are very encouraging, but trials on a large number of patients of all ages are needed to determine the effectiveness, limitations and practicability of this type of local anesthesia in dentistry.

BIBLIOGRAPHY

1. ALLEN, F. M.: *Am. J. Surg.*, 55:451-466, March 1942.

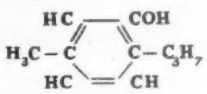
2. BLACK, Commander A. P. (MC) U.S.N. R., Personal Communication.

THYMOL IN CAVITY STERILIZATION

HERBERT WARD DAY, D.D.S., Seattle, Wash.

THE effectiveness of undiluted thymol in pure liquid form for cavity sterilization is the subject of this research. In order to make the results as scientific as possible, nothing has been taken for granted. There are three separate phases to this study. The first is to establish the type of bacteria with which we are working. The second is to establish a phenol coefficient for thymol using pure cultures from caries. The third is to show the actual penetration of thymol in the infected dentin.

Thymol, one of the essential oils, is obtained from the plant *Thymus vulgaris* and from synthetic sources. It possesses a true benzene ring, although it resembles the terpenes in showing a methyl and a propyl group. It occurs in large, colorless, rhombic prisms having an aromatic odor and taste. One gram is soluble in 1,000 cc. of water, about 1 cc. of alcohol and 0.7 cc. of chloroform, as well as 1.7 cc. of olive oil. It is of neutral reaction. The preparation has a relatively low toxicity, being given orally in doses of 2 gm. The melting point is 51.5° C., the boiling point 232° C. It is important to note the melting point as it is the melted crystals that are used in the tooth.



The same general procedure was used for obtaining bacteria in all three phases. In order to maintain aseptic conditions, the rubber dam was applied, then the area was washed with 7 per cent solution of iodine and then with alcohol. Portions of decayed tooth were removed from the mouth with a sterile spoon under sterile conditions, and placed in a 0.5 per cent glucose broth pH 7. In some cases in which portions of decay could not be removed from the tooth, a sterile syringe was used to place the broth in the cavity. Then, with a sterile spoon, the dentin was scraped and the scrapings removed with the syringe and placed in the test tube. The tube was then placed in a refrigerator until the time of plating, which was done some time during the day that the sample was taken.

The first phase of the study was to isolate the organisms of caries for the purpose of running phenol coefficients with pure cultures. Samples of decay were taken from teeth A, B, C, D and E for identification purposes. The plating procedure for samples A and B was as follows: Quantitative dilution plates were made from each sample in the following order: 1 cc. of undiluted material from the glucose-broth tube: 1 cc. of a one-tenth dilution; 1 cc. of a one-hundredth dilution, and 1 cc. of a one-thousandth dilution. Dilutions were made in sterile measured water blanks.

Three different agar media were used: glucose, plain, pH 7.2, and tomato, pH 7. Plates of each dilution and of each medium were incubated, both aerobically and anaerobically at 37.5° C.

Some of the original of sample B was heated ten minutes at 90° C. and streaks made from it on plain agar. These spore streak plates were incubated aerobically and anaerobically at 37.5° C. There were no spore-bearers found.

The growth on tomato and glucose agars was approximately equal, running from about twenty to sixty colonies on plates with undiluted inoculum. Samples A and B had about equal numbers. The

general appearance of the colonies which were on different media and which were from different teeth was the same. Transfers were made from the colonies examined to agar slants of the same kind of medium as the colony was in, for further identification. The seal on the anaerobic jar broke; therefore, there was no absolute anaerobic condition for samples A and B.

The plating procedure for sample C was as follows: dilution plates of plain agar, glucose-agar and tomato-agar were made by using 0.5 cc. and 0.1 cc. of the undiluted sample in each of two plates.

Spore streak plates were made in the usual manner on each of the three agars. Two plates from a single inoculation were made with each medium. Plates were incubated aerobically and anaerobically at 37.5° C. No growth appeared on either the aerobic or the anaerobic spore plates and little growth was found on any of the aerobic plates. No colonies were picked from these plates. On the anaerobic plates of tomato-agar, three colonies were present, two of which had a moldlike appearance. Six bacterial colonies appeared on anaerobic plates of plain agar. Three colonies were transferred from each of these plates and placed on slants for further identification.

The plating procedure for sample D was as follows: The tooth was plated on

Fig. 1.—Cavity found in first molar in first case studied.

Fig. 2.—Decay left in cavity pictured in Figure 1 for treatment with thymol. The depth of penetration of thymol can be seen. This area of decay was sterilized.

Fig. 3.—Decay for incubation in samples 3, 4 and 5.

Fig. 4.—Tooth shown in Figure 3, a year and four months later, in perfect condition. The proximity of the decay to the pulpal horn is to be noted.

tomato, glucose and plain agars in 0.5 cc. and 0.1 cc. amounts from the original inoculum of glucose broth. One set was incubated aerobically and one set anaerobically at 37° C. Spore streak plates, one each, were made on tomato, glucose and plain agars and incubated both aerobically and anaerobically at 37° C. The inoculum was held overnight in the icebox before plating.

Fig. 5.—Decay left for treatment with thymol in cavity of second tooth tested; and area sterilized by the treatment. From this tooth, samples 6 and 7 were taken.

Fig. 6.—Decay removed for samples 8 and 9 from tooth shown in Figure 5.

The plating procedure for sample E was as follows: The tooth was plated in duplicate on tomato-agar and glucose-agar, 0.5 cc. and 0.1 cc. of the original glucose broth inoculum being used. Duplicate plates of each medium were incubated both aerobically and anaerobically.

The accompanying tables are for the purpose of identifying the specific bacteria of caries.

From the foregoing studies, it was concluded that our method of culturing was successful with very little contamination and the identification tests indicated that the large majority of the organisms isolated belong to the Lactobacillus group and are closely related if

Fig. 7.—Decay left for treatment with thymol in the third and fourth teeth studied. The thymol penetrated the remaining area of decay.

Fig. 8.—Decay removed from tooth in Figure 7 for incubation in samples 16, 17, 18, 19, 20 and 21.

not identical with *Lactobacillus acidophilus*.

Our second phase in this study of thymol penetration was to determine phenol coefficients of thymol, using organisms from tooth decay. A pure culture (organism No. 67) was used and incubation

TABLE 1.—MORPHOLOGY OF CARIES CULTURES

Tooth Sample	Plate	Colony No.	Colony Appearance	Morphology of Organism
A	Tomato anaerobic, undiluted	1	White, round, entire subsurface	Gram-positive short rods in chains
A		2	White, round, glossy, entire surface	Gram-positive short rods, single, pairs and short chains
A		3	White, elliptical, entire subsurface	Gram-positive, short rods,
A		4	White, solid center, cloudy, halo, dull, entire subsurface	chains
A		5	White, elliptical, entire subsurface	Gram-positive short rods, chains
A		6	Large, white, round, entire subsurface	Gram-positive short rods, chains
B		7	White, elliptical, entire subsurface	Gram-positive short rods, single, pairs, occasional chains
B		8	White, elliptical, glossy, entire subsurface	Gram-positive short rods, long chains
A	Glucose, anaerobic, undiluted	10	White, round, glossy, entire subsurface	Gram-positive short rods, long chains
A		11	Large, white, round, entire subsurface	
A		12	Small, white, round, subsurface	Gram-positive short rods, chains
A		13	White, elliptical, entire subsurface	Some gram-negative short chains and gram-positive, both long rods
B		14	Large, round, white, dull, entire subsurface	Gram-positive short plump rods in pairs
B		15	Small, elliptical, white, subsurface	Gram-positive short rods, single, pairs and chains
B		16	White, round, entire subsurface	Gram-positive short rods, single, pairs and chains
A	Tomato aerobic, undiluted	17	White, round, entire subsurface	Gram-positive long rods, single and in chains
A		18	White, elliptical, subsurface	Gram-positive short rods, chains
A		19	White, round, pinpoint, subsurface	
A		20	White, round, entire pale halo	Gram-positive and gram-negative very long rods in chains
B		21	Large, round, entire subsurface	Gram-positive short rods, single and in pairs
B		22	White, elliptical, subsurface	No growth
B		23	Small, white, round, dull, halo, subsurface	Gram - positive rods, chains, no growth
A	Glucose aerobic, undiluted	24	White, round, entire subsurface	Gram-positive rods, long chains
A		25	White, round, entire subsurface	Gram - positive rods, chains
B		26	White, pinpoint	
B		27	White, elliptical, subsurface	Gram-positive rods, single and in pairs
B		28	White, round, entire, dull halo, subsurface	
A	Plain aerobic, undiluted	29	White, round, entire, dull halo	
A		30	White, round, entire surface	Gram-positive tiny rods

TABLE 1 (Continued)

Tooth Sample	Plate	Colony No.	Colony Appearance	Morphology of Organism
A		31	White, pinpoint	Gram-positive, rod, single and chains
C	Tomato, anaerobic	A	White, subsurface moldlike	Gram-positive long slender rods
C		B	White, subsurface, moldlike	Gram-positive long slender rods
C		C	White, round, subsurface	Gram-positive, coccus, clusters
C		D	White, round, subsurface	
C		E	Same	Transplants failed to grow
C		F	Same	
2	Tomato, anaerobic	32	Surface, convex, round, white, glistening	Gram-positive rods
2		33	Submerged, round, white	Gram-positive rods
2		34	White, dull, round, concentrated in center, cloudy	Gram-positive rods
2	Plain anaerobic	35	Pinpoint	
2		36	Pinpoint	
2		37	Pinpoint	Gram-positive rod
2	Glucose anaerobic	38	Glistening, round, white, surface	Gram-positive rod
2		39	Same	Same
7	Tomato, anaerobic	40	Large, white, spreading	Gram-positive, very small rods
E	Tomato, aerobic	41	White, round, glistening surface	Gram-positive rods
E		42	White, ellipsoid, subsurface	Gram-positive large, coccus
E	Glucose, aerobic	43	White, round, subsurface	
E		44	White, round, tiny	
I		45	White, subsurface	
I		46	White, tiny	
I	Plain aerobic	47	Rough, crenate, yellow	
I		48	Rough, crenate, yellow	
I	Tomato, aerobic	49	White, round, entire	
I		50	Same	
2		51	Small, white, round	
2		52	White, surface, round	Gram-positive rods
2	Plain aerobic	53	Round, white, small	
2		54	White, entire	
2	Glucose, aerobic	55	Round white, entire	
2		56	Same	
6		57	Same	
6		58	Same	
6	Plain aerobic	59	Rough, crenate, yellowish	
6		60	Same	
6	Tomato, aerobic	61	White, round	
6		62	Same	
E	Glucose, anaerobic	63	Subsurface, ellipsoid, white	Gram-positive coccus
E		64	Surface, white, round, glistening, large	
E		65	Small, round, white, subsurface	
E	Tomato, anaerobic	66	Large, round, white, glistening surface	
E		67	Same	Gram-positive rods (0.6 by 2 microns)
E		68	Small, white, elliptical, subsurface	Gram-positive

was at 37° C. Tests were made at pH 7 with 1 per cent McIllvaine's buffer, 0.5 cc. of culture, with a total volume of 5.1 cc. for both phenol and thymol.

Thymol stock solution was prepared by dissolving 0.4031 gm. of thymol in a total of 500 cc. of distilled water. The material was heated to help dissolve the thymol and shaken in a mechanical shaker. The concentration of stock thymol was 0.08062 per cent, or 1/1204.4.

Fig. 9.—Decay left for treatment with thymol.

Fig. 10.—Case in which sterilization was not effected in teeth shown in Figure 9 because decayed area was too great. The seal on the first molar was faulty.

The phenol coefficient test shows that it takes a dilution of 1/100 of phenol to destroy 0.5 cc. of pure culture, whereas it takes only a dilution of 1/2,340 of thymol to destroy the same amount of cultures in the same time, five minutes.

Our results using pure cultures of the lactobacillus show that thymol is 23.4 more germicidal than phenol. Phenol, then, is contraindicated in cavity sterilization; i.e., because of its low germicidal powers and its high caustic qualities.

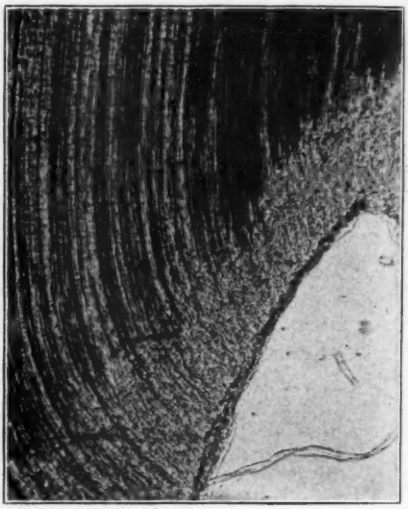


Fig. 11.—A photomicrograph (×160) showing formation of secondary dentin at the apex of pulpal horn.

Fig. 12.—Extent to which Nature tried to protect pulp from chemical and thermal irritation. The secondary dentin has almost filled the pulp chamber.

TABLE 2.—PURE CULTURE REACTIONS

Media	Organisms: 20	21	10	31	16	130	13C	13B	13A	32	33	Pure Culture 67	Pure 31	Pure 1	Pure 24	Pure 5	Pure 45	L. Casei	L. Bulgaricus	L. Acidophilus
Litmus milk	SA		A	SA	–	–	–	–	–	A	A	A	A	A	A	A	A	A	A	A
Sucrose	A	–	A	A	A	A	SA	SA	SA	A	A	A	A	A	A	A	A	A	–	A
Glucose	A	–	A	A	–	A	SA	SA	SA	A	A	A	A	A	A	A	A	A	A	A
Lactose	A	–	SA	A	–	–	A	–	–	A	A	A	A	A	A	A	A	A	A	A
Maltose	A	–	SA	A	–	A	–	SA	–	A	A	A	A	A	A	A	A	A	A	A
Mannitol	A	–	A	A	–	–	–	–	–	A	A	A	A	A	A	A	A	A	A	A
Potassium nitrate, broth	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Peptone	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Acetyl-methyl-carbonal	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Gelatin										–	–	A	–	–	–	–	A	–	–	–
Methyl red	–		+	+	–	–	–	–	–	–										

*A, acid; –, negative; SA, slightly acid.

TABLE 3.—DILUTIONS OF PHENOL

Final Concentration	5% Phenol	5% Buffer	Water
1/80	1.25 cc.	1.0 cc.	2.75 cc.
1/90	1.11 cc.	1.0 cc.	2.89 cc.
1/100	1.0 cc.	1.0 cc.	3.00 cc.
1/110	0.91 cc.	1.0 cc.	3.09 cc.
1/120	0.83 cc.	1.0 cc.	3.17 cc.

TABLE 4.—DILUTION OF THYMOL

Final Concentration	1/1204.4 Thymol	5% Buffer	Water
1/2.160	2.78 cc.	1.0 cc.	1.22 cc.
1/2.340	2.58 cc.	1.0 cc.	1.42 cc.
1/2.520	2.39 cc.	1.0 cc.	1.61 cc.
1/2.700	2.23 cc.	1.0 cc.	1.77 cc.
1/2,880	2.09 cc.	1.0 cc.	1.91 cc.

TABLE 5.—RESULTS OF PHENOL AND THYMOL TESTS*

Phenol

Time Min.	1/70	1/80	1/90	1/100	1/110
5	—	—	—	—	+
10	—	—	—	—	—
20	—	—	—	—	—

Thymol

	1/1,980	1/2,340	1/2,520	1/2,700	1/2,880
5	—	—	+	+	+
10	—	—	+	+	+
20	—	—	—	—	—

*—, no growth; +, growth.

Phenol, with relatively no antiseptic properties, will burn delicate tooth structures, whereas thymol will not burn and its action is not self-limiting. A few crystals of thymol left in the dentin cavities will sterilize indefinitely.

The third and most important phase of this study was the actual tests of thymol penetration into the area of decay. Class 1 cavities were chosen for their easy access and easy control factors. The thymol was applied to the teeth by warming a pair of cotton pliers, holding the points together, and dipping them into the pure crystals. The melted crystals will adhere to the space between the

points at the tip, and the point of the pliers is then inserted in the cavity and opened slowly to allow the liquid to run into the area involved.

The first two teeth treated were tested before the treatment medium was sealed in, as a control factor and as a means of further identification. X-ray films were taken in each case to visualize the amount of decay left for treatment. Figure 1 shows the original cavity in the first molar. From the first tooth, sample 1 was taken superficially from the cavity of the tooth and sample 2 was taken from deep in the same cavity. Each of these samples were plated in 0.5, 0.1 and 0.01 cc. of glucose broth inoculum, measured with a 1 cc. pipet. Spore plates were then made by the streak method, followed by two plates in the case of those incubated

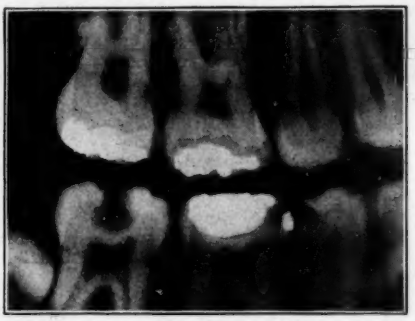


Fig. 13.—Original cavities of lower first and second molars, treated with thymol in 1936.

Fig. 14.—Teeth shown in Figure 13, seven years later.

Fig. 15.—Regeneration of secondary dentin under exposed pulp of first molar, capped in 1933.

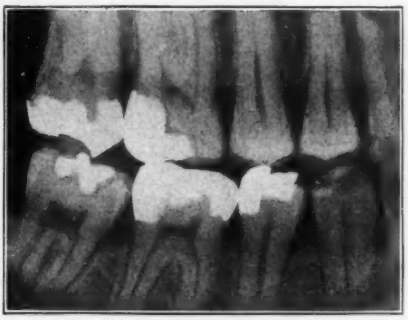


Fig. 16.—Upper first molar, showing exposed pulp wherein some infected dentin was left and sterilized with thymol in 1939.

Fig. 17.—Pulp of first bicuspid exposed to caries, but capped with decay remaining over horn; sterilization being affected without rupture of pulpal wall.

aerobically and only one plate for those anaerobically incubated. Figure 2 shows the amount of decay left in the tooth after the treatment with thymol.

The thymol was sealed in for a period of four weeks. Figure 3 shows the cavity with the decay, used in samples 3, 4 and 5, removed for incubation. The proximity of the decay to the pulpal horn is evident.

Figure 4 shows the same tooth a year and four months later, in perfect condition.

The second tooth was handled in the same manner. (Fig. 5.) Sample 6 was taken superficially and sample 7 was taken from deep in the same cavity. Each sample was plated in 0.5, 0.1, and 0.01 cc. of glucose broth inoculum by measuring with a 1 cc. pipet. Spore plates were made by the streak method, followed by two plates in the case of those incubated aerobically and only one plate for those anaerobically incubated. Figure 5 shows the decay left for treatment in the first molar and Figure 6 shows the decay removed for samples 8 and 9.

TABLE 6.—RESULTS WITH ANAEROBIC PLATES

Tooth	Tomato	Plain	Glucose
	0.5 cc.	Inoculum	
1	No ana	erobic plate	
2	+	+	+
6	No ana	erobic plate	
7	+	+	+
	0.1 cc.	Inoculum	
1	No	plates	
2	+	+	+
6	No	plates	
7	+	+	+

No spore forming organisms were present.

Anaerobic plates were made only for the deep cavity samples, 2 and 7. Results from samples 1, 2, 6 and 7 of the first and second teeth are shown in Table 6. No spore forming organisms were present.

The approximate number of organisms per cubic centimeter in original glucose broth inoculum is shown in Table 7.

Samples 3, 4, 5, 8 and 9 were taken from these two teeth after the treatment medium had been sealed in for four weeks. Pour plates were made and incubated at 37.5° C. aerobically. These samples were plated in 1 cc. and 0.5 cc. quantities in both glucose and tomato juice-agar. The original tubes of glucose which contained the inoculum, on incubation at 37.5° C, for twenty-four hours, presented no visible growth.

TABLE 7.—RESULTS WITH AEROBIC PLATES

Tooth	Tomato	Plain	Glucose
2	3,700	2,800	2,900
1	Too many even on 0.01 cc.		Too many on 0.01 cc.
		750	
6	1,800	6,000	7,000
7	1 colony	1 colony	100

TABLE 8.—RESULTS OF INCUBATION TESTS

Sample	Glucose	Tomato	
11	No growth	No growth	First molar (Fig. 10)
13	1,000 cc. estimated count	1,000 cc. estimated count	
15	No growth	No growth	
10	270 cc.	360 cc.	Second molar (Fig. 10)
12	35 cc.	30 cc.	
14	No growth	No growth	

Transplants from the incubated inoculum were made to tomato and glucose-agar slants. These transplants proved negative in all the samples except sample 8, which showed contamination with a small growth. These organisms upon microscopic examination were found to be a gram-positive staphylococcus in both cases. No other growth appeared.

We can conclude, from these cases, that there was a penetration of the thymol into the dentin to the extent shown in Figures 2 and 3 in the case of

samples 3, 4 and 5 and in Figures 5 and 6 in the samples 8 and 9.

In order to determine whether the treated cavities were sterile, two more teeth were used. These were treated in the manner described and twelve samples, 10-21, were taken for plating. Two plates using tomato juice-agar and two using glucose-agar were poured for each sample. Incubation was at 37° C. Figure 7 shows the amount of decay left in the tooth for treatment with thymol.

Figure 8 shows the amount of decay removed for incubation for tests 16, 17, 18, 19, 20 and 21. There was no growth with either tomato juice-agar or glucose-agar.

There are three samples from each molar shown in Figure 8.

Figure 9 shows the amount of decay left in the tooth for treatment. Figure 10 shows the amount of decay removed for incubation for tests 10, 11, 12, 13, 14 and 15. (Table 8.) There are three samples from each molar shown in Figure 10.

Tests 10 to 15, as illustrated in Figure 9 and 10, showed that there was no penetration of thymol to the depth of the decay shown. Therefore, there is a limit to the area of decay that can be sterilized. However, the seal was faulty on the first molar. In the second molar, there was some growth demonstrated, but there was a definite inhibitive action and, as is apparent, there was too much decay.

The results of these bacteriologic studies of thymol penetration in caries indicate a definite sterilization in the presence of gross amounts of decay. Therefore, if pulp involvement seems probable, roentgenographically, but not clinically, small areas of decay can be left near the pulp and sterilized with thymol. In this way, the pulp is not infected through mechanical exposure, nor is the odontoblastic layer broken to retard the regenerative processes of secondary dentin.

Figure 11, a photomicrograph (×160), shows the formation of secondary dentin. This growth is distinguished by tubules that are thinner and less regular; more of a conglomerate mass. This view is at the apex of the pulp horn.

Figure 12 shows how secondary dentin has filled in under the gingival cavity, nearly filling the pulp chamber. This shows to what extent Nature tried to protect the pulp from chemical and thermal irritation.

Figure 13 shows the original cavities on the lower first and second molars in 1936. Figure 14 shows the same teeth seven years later. These pulps were originally exposed and a little infected dentin was left over the exposed area.

Figure 14 shows that secondary dentin has filled in under the pulp horn after seven years. Though it is best to prevent actual exposure, it is often impossible. Thymol was used in both of these teeth.

Figure 15 shows regeneration of secondary dentin under an exposed pulp that was capped in 1933. Thymol was used here also to sterilize remaining caries.

Figure 16 shows another exposed pulp where some infected dentin was left on the upper first molar. This was sterilized with thymol in 1939.

Figure 17 shows a first bicuspid pulp that was exposed to caries, but which was capped, decay remaining over the horn and sterilization being effected without rupture of the pulpal wall. This was sterilized and capped five years ago.

Thymol is 23.4 times stronger than phenol and its action is not self-limiting or caustic, and there is no discoloration. If the pulp is not infected, but bacteria have invaded to a point near or next to the pulp, it is best to leave a small amount of decayed matter over that area, rather than to cause bleeding by rupturing the wall. The infected dentin can be sterilized without injury to the odontoblastic layer and Nature will

thereby have a chance to build in secondary dentin and save the tooth.

Pure liquid thymol should be used in routine cavity sterilization, especially on the anterior teeth, because it does not discolor, and on the other teeth because of its high germicidal effects and slight caustic action. If the liquid is blown out of the cavity by warm air, a few crystals will remain in the porous dentin, but the cavosurface margins will be free.

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A NEW APPROACH TO THE TREATMENT OF DRY SOCKET

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DRY socket is a localized alveolar osteitis which may vary in severity from a mild irritation to a condition resembling a localized osteomyelitis. The process of healing involves considerable pain and discomfort and the complication is one of the more common postextraction troubles requiring the attention of the operator. Therefore, treatment by the most effective and rapid means is of great importance.

The sequel to oral surgical procedures which we term dry socket arises either because no blood clot develops in the alveolus after an extraction or because the clot is disturbed or destroyed. The absence of a clot is the important thing. Christopher[1] emphasizes this point in his statement that investigators who have based their findings on histologic study and those who have used clinical data are in agreement that interference with the blood clot in the socket is the important factor in failure to heal following extraction of teeth. The loss or interference induces a local osteitis by exposing the bone to infection from bacteria in the saliva or from decaying food that has lodged in the open socket.

ETIOLOGY

Since the literature and the oral surgical textbooks have thoroughly discussed the etiology of dry socket,[2, 3] this phase of the problem will not be discussed. However, it may be helpful in preventing the condition to list the following causes of absence of a normal clot:

1. The injection of anesthetic solutions containing strong vasoconstrictor agents, such as epinephrine, at the site of the extraction.
2. Forceful postoperative flushing of the socket.
3. Use of mouth rinses which destroy the clot, particularly hydrogen peroxide or alcohol solutions.
4. Excessive spitting and sucking of the wound or any mechanical manipulation of the clot with fingers, tongue, toothpicks, etc.
5. Permitting saliva to enter the alveolus or medication with strong drugs before the blood has coagulated.
6. Use of unsterile instruments.
7. Unwise curettage by the operator.

Acknowledgement is made for permission to use the illustrations in this paper. These photomicrographs were made from sections of human jaws and are from an original thesis, "A Histological Study of Bone Healing in Relation to the Extraction of Teeth" by F. Robert Christopher, D.D.S., M.S.D. (*Northwest. Univ. Res. Bull.*, Autumn, 1942.)

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8. The presence of sclerotic alveolar bone, which limits the blood supply of the area and inhibits normal postoperative bleeding.

9. Virulent periapical infection.

10. Bone injury from operative trauma.

SOCKET HEALING

Research and histologic studies of healing of sockets have demonstrated that there are two ways in which the bone regenerates to eliminate the alveolus: 1. There is a blood clot present which undergoes changes by new capillary invasion, and formation of fibrous connective tissue quickly occurs. (Fig. 1.) Organization continues and resolution is soon completed through ossification of the organized clot.[4] (Fig. 2.) 2. When there is no blood clot present to organize and calcify, infection, if present, is overcome by the body defenses, granulation tissue appears on the alveolar walls and, in from two to six weeks, the socket is obliterated. (Fig. 3.)

The tissue in the socket ossifies and resolution occurs. This second method of bone repair, which is much slower than the first, is usually painful owing to the inflammatory reaction of sensitive nerve endings in the exposed alveolar bone. Nature uses it only when she is unable to employ the more efficient clot-organization method of resolution.

Fig. 1.—Photomicrograph of section from a normally healing socket, taken two weeks after extraction of tooth; showing well-organized connective tissue surrounding remnants of original blood clot.

TREATMENT

The principal objective in treating dry

socket is to eliminate pain and to promote healing. The accomplishment of these ends has been the basis of innumerable papers and discussions on the subject. Many solutions of the problems have been offered, all based on acceptance of the theory that it is necessary to use Nature's second choice in socket healing methods, described above. Practically all thought has been directed to the means of obtunding the pain while the body defenses overcome the infection. With this rationale in mind, a great number of sedative drugs for local application to the alveolus have been used by the profession. Krogh,[5] reporting a study of 138 cases of dry socket, states that dressings impregnated with sedative drugs not only fail to shorten the recovery time, but also frequently provide too short a period of relief from pain between treatments. The same conclusions were reached by Claflin,[4] of the Research Department of the Chicago College of Dental Surgery. Of course, the wound heals eventually and bony consolidation follows. Meanwhile, however, the patient has been given inadequate relief from his pain and has been forced to make frequent and inconvenient visits to the dental office to have dressings changed. Even when the dentist is not blamed for the sequel to the extraction, it is an annoying and painful experience to the patient. From the operator's standpoint, the case requires

Fig. 2.—High power photomicrograph near apex of socket. To the left is the original alveolus; to the right, organized connective tissue. Calcification is proceeding normally.

considerable time and explanation often with loss of the patient's confidence.

A new approach to the treatment of dry socket is necessary for the elimination of the foregoing disadvantages. Since the chief causative factor in the process is the loss or absence of a sound clot, why not supply the missing blood? If we can furnish a new clot for the alveolus, we have the prime factor necessary to change slow healing to swift repair of a normal wound. Dry socket cases vary in degree of infectious involvement. The new treatment requires adoption of technical procedures to treat three main groups of cases. The technic for each group is as follows:

The Non-Septic Group (No Suppuration and No Sequestration).—This is the most common type of case and the easiest to treat. The teeth adjacent to the socket are scaled and the wound is cleansed by normal saline irrigation. The field is isolated with cotton rolls and the head of the patient is tipped back to keep the drainage of saliva away from the area. A saliva ejector is used on the opposite side of the mouth. The socket is carefully dried with sterile cotton or gauze. Care in this step will permit one to do this painlessly. Under a good light, the absence of saliva and débris is confirmed. When the area is isolated and the wound is cleansed, the alveolus is filled with blood.

Fig. 3.—Photomicrograph showing both normal and abnormal healing. In the center is a section of interseptal bone; to the right, a normally healing socket; to the left, a dry socket.

A rapid and efficient method of obtain-

ing the blood is that employed to obtain blood for Wassermann examinations. It is easy and requires no anesthesia. All that is required is application of a small length of rubber hose comfortably tight above the elbow of either arm, as a tourniquet. The fingers of the arm to be used are flexed rapidly several times.

One of the large veins in the cubital fossa is selected, the skin is swabbed with alcohol and a 19-gage needle attached to a syringe is carefully inserted in the vein. The plunger of the syringe is slowly withdrawn and 2 cc. of blood is drawn into the barrel. This amount is sufficient for even the largest socket. After the blood is taken, a cotton swab is placed over the puncture point and the syringe is withdrawn. The tourniquet is removed and the patient is told to hold the compress over the tiny puncture wound for a few minutes. No arm dressing is necessary.

For those desiring an alternate method, i.e., securing blood from the mouth, a second method may be used. The area adjacent to the socket is anesthetized by *conduction anesthesia.* Infiltrating the area is contraindicated as it inhibits free bleeding. Then a small incision is made in the healthy non-inflamed tissue adjacent to the socket. With a suitable instrument, a slight flow of blood into the alveolus is induced. Obtaining blood by

Fig. 4.—High-power photomicrograph objective showing labial wall of tooth socket containing no blood clot ten days after extraction of tooth. Osteoclasis is in progress and sequestration is developing.

curettage of the socket itself is likely to spread any infection present and, in actively infected cases, it may produce an osteomyelitis.[6] The alternative method should not be employed when gum tissue adjacent to the socket is infected. Everything considered, the method first described has greater advantages.

Blood is slowly deposited in the cleansed and dried socket until it just starts to overflow into the mouth. It is of great importance that no saliva come in contact with the area at this stage. The operator should be vigilant in keeping a dry field, using cotton rolls on each side of the socket. Tipping the head of the patient so as to keep saliva draining away from our field is very helpful. After the blood coagulates, the patient is given instructions to avoid disturbing the clot in any way. He is told particularly to avoid the use of alcohol and of mouthwashes, and to avoid vigorous spitting and sucking of the wound. The patient is requested to go to bed early that night and to return the following day.

There is seldom any further treatment. Patients, reporting the next day, usually state that the pain has disappeared, and that the condition of the mouth no longer annoys them. Healing, from the clinical standpoint, appears to be that following uneventful extractions.

Fig. 5.—Photomicrograph (high power) showing labial wall of tooth socket containing no blood clot ten days after extraction of tooth. Osteoclasis is in progress and sequestration is developing.

A few patients may disregard instructions and lose the new clot. This is easily remedied by repeating the procedures described.

Mildly Septic Group (Slight Suppuration, with No Sequestration).—The majority of dry sockets are in the initial stage of involvement when the dentist is consulted. The patient usually will re-

turn when painful symptoms arise. However, some patients come in with a mild degree of pus formation at the base of the alveolus. The standard procedures outlined above are used except that a small amount of sulfadiazine or sulfathiazole powder is placed in the bottom of the socket. Only a small amount of the powder should be used since filling the socket with a sulfa powder often disturbs or destroys the blood clot. The sulfathiazole or sulfadiazine will combat any local infection, and resolution then proceeds rapidly.

Septic Group (Active Suppuration with Sequestration).—The number of cases reaching the stage of socket sequestration is not large. Examples of the condition can be seen in Figures 4 and 5. The treatment in this group of cases is the same as for any localized osteomyelitis. Drainage is essential, and conservative measures should be used. Resolution is not possible until infection is controlled and sequestra have been eliminated. Treatment consists of hot saline irrigations and the use of socket dressings impregnated with a sedative drug. Eugenol, guaiacol and benzocaine combined make a good sedative.

An extremely severe infection about a socket is usually a borderline osteomyelitic condition, requiring the conservative therapeutic measures applicable to osteomyelitis. These measures, which have been discussed in a previous paper,[6] consist of drainage, local and systemic chemotherapy and general supportive measures. Resolution follows when the sequestration stage has passed.

In treating a suppurating dry socket, the prime objective is to overcome the local infection, then wait for the acute symptoms to subside. When this stage has been reached, it is possible to cause rapid resolution by filling the socket with a good blood clot, which will organize, and calcify much more rapidly than if healing by granulation occurs. Thus, even in unusual and severe cases, the principle of supplying the blood clot essential for organization and rapid healing can be employed to great advantage.

SUMMARY

1. Dry socket, a localized osteitis, is one of the more severe extraction complications. It is characterized by the absence of a blood clot in the alveolus.

2. In many cases, a review of the various causes for clot destruction or absence is helpful in preventing the condition.

3. The healing of dry sockets can be greatly shortened by the use of the new approach to treatment suggested here.

4. The new approach to rapid healing of the dry socket consists of eliminating infection and supplying the alveolus with a blood clot.

5. With formation of a clot, the socket quickly returns to a state of normal healing. Pain disappears and uneventful recovery proceeds. The clot is replaced by connective tissue and calcification occurs.

6. The methods presented for obtaining a new blood clot are simple and effective. The technic can be employed by any dentist.

7. The treatment of dry socket by clot organization rather than by granulation healing will eliminate the condition as a serious postoperative complication of tooth extraction.

BIBLIOGRAPHY

1. CHRISTOPHER, R. H.: Histological Study of Bone Healing in Relation to Extraction of Teeth. *Northwestern Univ. D. Bull.*, 43:5, December 7, 1942.

2. GARDNER, B. S.: Postoperative Considerations Regarding Extraction of Teeth. J.A.D.A., 16:2, January 1929.

3. MEAD, S. J.: Oral Surgery. St. Louis: C. V. Mosby Co., 1938, p. 1010.

4. CLAFLIN, R. S.: Healing of Disturbed and Undisturbed Extraction Wounds. J.A.D.A. 23:945-959, June 1936.

5. KROGH, H. W.: Incidence of Dry Socket. J.A.D.A., 24:1834, November 1937.

6. ELWELL, K. R.: Osteomyelitis in the Jawbones. *Mil. Surgeon*, 91:545, November 1942.

ROOT-CANAL THERAPY AND THE USE OF SULFONAMIDES

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IN root-canal therapy, we have to contend with an infectious condition of the pulp caused by the invasion of either staphylococci or streptococci, or both. In 1935, Domagk demonstrated that mice could be protected against fatal doses of streptococci with prontosil.[1] This discovery was the forerunner of the use of the sulfonamide group of drugs, and a new weapon had been evolved to combat infection from these organisms.

The mode of action of sulfonamides is thought to be primarily bacteriostasis. Long and Bliss, in 1936, found that the drug acted directly on the bacteria, destroying the capsules of these microorganisms and rendering them more susceptible to destruction in this avirulent state by the defense mechanism of the individual.[2] It has been observed further by Lockwood[3] that any product of protein digestion, such as is found in a necrotic area, will inhibit this bacteriostatic activity of the sulfonamides. This action is explained by the close similarity of the chemical structure of the drugs of this group and that of para-aminobenzoic acid, a product of protein hydrolysis. One competes with the other in bacteriometabolism.[4] This fact is very important, as it tells us that, before an infection is ready for chemotherapy, all necrotic material and débris must be removed. This precaution is as necessary in root-canal therapy as it is in any other form of surgical procedure.

In dentistry, the sulfonamides commonly used are sulfanilamide, sulfathiazole and sulfadiazene. In root-canal therapy, we are concerned with the same drugs. The specific action of these drugs on certain organisms has been determined,[2, 5, 6, 7, 8] and it is advisable to choose the drug on the basis of the organism present. This effect has been interpreted by the reaction of the drug and the enzyme secreted by the bacteria. The enzyme of one type of bacteria may be interfered with by one of the sulfonamides, while that of another remains unaffected.

When to use the drug, and which one to use, therefore depends on the type of infection present. Sulfanilamide has been found to be more efficacious against streptococcic infections; sulfathiazole against staphylococcic infections, and sulfadiazene against mixed infections, especially in the presence of *Streptococcus viridans*. From these facts, we may deduce that for an acutely abscessed and purulent pulp, the staphylococcus being the chief offender, we should employ sulfathiazole. Chronic abscesses, such as are seen with granulomas, generally reveal a streptococcus infection in which the use of sulfanilamide would be more efficacious. Sulfadiazene, being used where mixed infections are present, may be applied in either case. It is permissible, however, to interchange these drugs in some instances, since the line of bacteriostatic action is not definitely drawn.

The sodium salts of these drugs have a high degree of alkalinity, the pH ranging from 9 to 11. They are, therefore, extremely irritating and should not be used. When in saturated solutions, they have been known to coagulate human serum.[9, 10]

The bacteriostatic and the bactericidal

properties of the sulfonamides have been demonstrated by many investigators. Adams[11] states that "the hot sulfanilamide solution is bacteriostatic after 60 seconds' contact with the growth, but continued contact with the drug after the first immersion is bactericidal." Other investigators, such as Goodman and Gilman,[12] have shown this effect *in vitro* and reached the same conclusion when they applied the drug to open wounds or infections.

The local application of the sulfonamides, although it had come into use after the method of oral administration, has shown outstanding results. In the military field, this has been taken advantage of to the extent that every American soldier who goes into action is provided with 5 gm. of sulfanilamide powder, which is to be implanted immediately in any wound.[13] Moorhead,[14] in reporting an extensive military experience following the Pearl Harbor disaster, stated that he obtained good results in the treatment of wounds by adequate early cleansing followed by débridement and dusting into the wound of a sufficient quantity of sulfanilamide or sulfathiazole. McGehee[15] has reported a series of 407 cases of perforated appendix wherein sulfanilamide was employed locally with a mortality of 6.2 per cent. Previously, in a control series, the mortality had been 41.5 per cent. It has been further observed that local application in wounds may produce as much as from 10 to 20 times higher concentration of the drug in the area than can be obtained by systemic administration. This high has been as much as 500 mg. per hundred cubic centimeters of local tissue fluid with a blood level high of approximately 2 mg. per hundred cubic centimeters, a quantity well under the level of toxicity.[2] The quantity of sulfonamides used in root-canal therapy is even smaller and their local application is, therefore, not great enough to affect any systemic disorders.

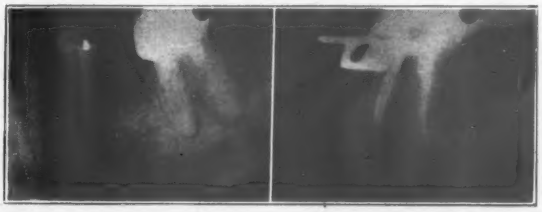

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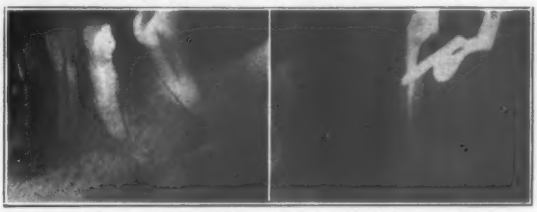
Fig. 1.—Case in man aged 35. The patient complained of a dull ache in the area. A, appearance in February 1941; showing improper treatment rendered a number of years ago in Greece. B, tooth properly treated and filled. The symptoms have subsided.



A B

Fig. 2.—Case in woman aged 43. A, appearance November 1939; showing faulty treatment. The patient complained of sensitivity of the tooth. B, condition after root-canal therapy had been repeated.

There has been considerable discussion of the efficacy of the local use of sulfonamides in the mouth after extractions. The results may be questioned by the fact that the drug, incorporated by the tissue fluid of the wound, is constantly exposed to the action of saliva and the contamination of the mouth. In surgical procedures involving a closed cavity, as in abdominal operations, as well as root-canal therapy, outside contamination does not exist and the action of the sulfonamides is left unimpaired.

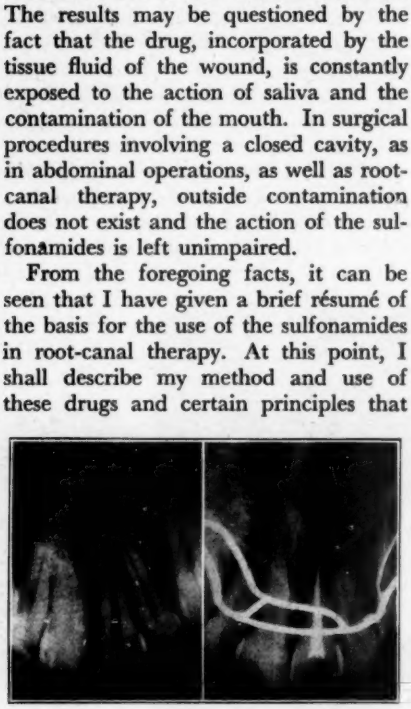
From the foregoing facts, it can be seen that I have given a brief résumé of the basis for the use of the sulfonamides in root-canal therapy. At this point, I shall describe my method and use of these drugs and certain principles that I adhere to in treatment. To begin with, chemotherapy is just part of a technic of root-canal treatment. It is necessary to supplement this at the outset with proper and sterile instrumentation as well as to complete the treatment with the correct filling of the canal. Figures 1 and 2 illustrate cases of which one might say that failure in root-canal work was due to a faulty method of therapy in more than one phase. In both instances, subjective symptoms of discomfort were called to my attention by the patient, and disappeared after proper treatment and root-canal filling.

I use the sulfonamides (1) whenever infection of the pulp or periapical area is suspected and (2) only when these drugs can be applied so as to come in contact with tissue fluid.

Vital pulps obviously do not need comparable chemotherapy; therefore, these drugs are unnecessary. If there is pulp degeneration, with a loss of the germicidal blood supply, or infection has progressed beyond the apex, I utilize the aid of the sulfonamides to eliminate infection and so assist the body in its work of repair.

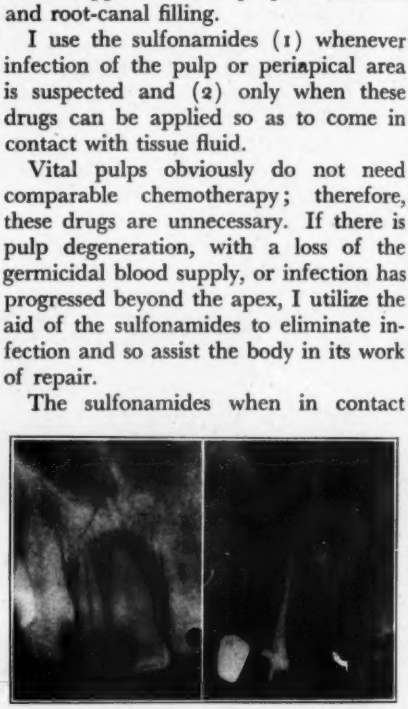
The sulfonamides when in contact with tissue fluid are readily absorbed. The method of use of these drugs is therefore based on this principle. Because of their high degree of diffusibility, they may, through absorption, attain a wide area of distribution in the body.[16] In root-canal therapy, the drugs are applied, therefore, in a manner to make contact with tissue fluid, in order to cause absorption.

Sulfanilamide and sulfadiazene are used in solution form as irrigants. Sulfathiazole, although more difficult to obtain in solution, is applied as a powder



A B

Fig. 3.—Case in girl aged 13. The pulp of the tooth had become acutely abscessed as the result of a blow. A, condition March 1941 before treatment; B, October 1941. The tooth had been rendered comfortable soon after treatment, which was completed in six visits. Orthodontic treatment was instituted soon after.



A B

Fig. 4.—Case in boy aged 19. The tooth had become abscessed as the result of carious exposure. Treatment was completed in five visits. A, condition November 1941, before treatment; B, April 1942.

or made into a paste with glycerin and mixed with the purulent exudate in the canal of a tooth. In this form, it may be used as a dressing. Sulfanilamide, having the greatest solubility of the group, is dissolved in sterile water or saline solution. Although it is soluble to the extent of 1.46 per cent in water at body temperature,[17] solubility is increased to more than 6 per cent at 60° C. (140 F.),[18] at which temperature it is applied. The use of a warm solution enhances the bactericidal action. When it is injected locally, 1.97 per cent will be soluble in human serum at body temperature.[17]

Sulfadiazene, like sulfathiazole, has a low solubility, but recently has been compounded in a solution of 2.5 per cent sulfadiazene in 8 per cent triethanolamine. This mixture has a pH of about 8.7, is not toxic and is readily absorbed by the tissue. Its use has been determined by a group of investigators[19, 20] from the Department of Otolaryngology at the Johns Hopkins University and Hospital and found successful in controlling the growth of pyogenic organisms in the upper air passages, with a marked decrease in the incidence of sinus, ear, pharynx and bronchial infections. Their deduction was that, although these areas were not sterilized, the clinical results suggest that certain strains of bacteria react in such a way as to lose their virulence or their ability to become virulent. Since the type of tissue involved in such infections is similar to those tissues in the root canal, the mixture can be similarly used for such treatment. I have applied it to the canal as sulfanilamide is applied, as an irrigant, after the solution has been heated.

If the sulfonamides are used in the sterile crystalline form, there will be little, if any, interference with the healing process. Since the primary aim in any treatment is to permit Nature to set up her healing mechanism quickly, by controlling infection with a sulfonamide we obtain this objective. This fact has been substantiated by many investigators, among them Colebrook, Francis,[21] Taffel, Harvey[22] and others.[23]

Bacteriologic examination will determine primarily when a canal is ready for filling. For this purpose, a culture of a medium of glucose-ascites broth or brain-heart infusion broth, or the like, may be used; or the findings may be determined by a smear through microscopic examination. For accuracy, the culture is the more precise method. However, although the bacteriologic examination of root canals will serve as a valuable guide, as well as lead the oper-

A B

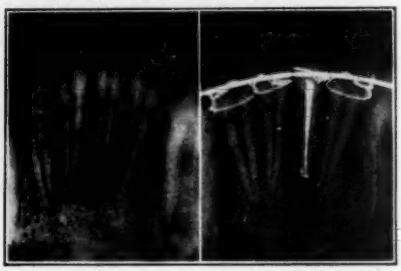
Fig. 5.—Case in woman aged 56. A traumatic abscess developed, with acute symptoms. A, condition November 1941; B, July 1942. Treatment called for six visits.

A B

Fig. 6.—Case in woman aged 32. The patient was referred for root-canal therapy after a prolonged attempt at treatment by another dentist. The symptoms had become acute. A, condition February 1943; B, June 1943. Six visits were necessary.

ator to preserve a sterile technic, it is still debatable whether absolute sterility is possible or necessary before a canal may be filled. As Cahn[24] states: "Surgeons do not wait for negative cultures until they close a wound. If they did, most patients after a laparotomy would be lying around with their entrails hanging out."

If the total number of bacteria can be reduced or even kept constant, the white blood cells can be relied on to eliminate them. The trouble is that bacteria multiply exceedingly fast, it having been estimated that under proper conditions a single bacterium produces one billion descendants in fifteen hours; hence, the need for such deterrent agents as the sulfonamides. In the past, I have used the culture method at the start of



A B

Fig. 7.—Case in boy aged 13. An acute abscess developed from a blow. The patient was having orthodontic care at the time. A, condition November 1942; B, April 1943. Treatment called for six visits, after which orthodontic treatment was resumed.

chemotherapy with the sulfonamides mainly to determine the time of treatment. At present, I have discontinued the use of cultures, but still resort to smears as a guide to therapy. I have found the average number of visits in most cases to be five or six. Adams reports that the average for fifty-two cases is 3.18 treatments.[25]

I had previously confined my treatment in root-canal therapy to the orthodox medicaments, namely eugenol, beechwood creosote, cresatin and triformocreosol, using as well electrosterilization. By this method alone, I found that purulent and acutely infected teeth required a dozen or more treatments before a negative culture or smear could be obtained. Since the use of sulfonamides, the number of such treatments in practically all cases has been reduced at least half. I still, however, use the above-mentioned drugs in conjunction with sulfonamide therapy because of tissue tolerance of repetitious application of the same drugs, and because some of these conventional drugs assist in the elimination of the products of protein hydrolysis, thereby enhancing the action of the sulfonamides.

The accompanying roentgenograms show examples of results of the method of root canal treatment just described. Figures 3 to 7 indicate the condition of teeth before treatment and the results of healing processes as shown by these teeth in roentgenograms taken approximately six months later.

The use of sulfonamides may be further superseded by the newer developments of such bactericides as gramicidin and penicillin. Gramicidin was obtained from soil bacteria in 1939 by Rene Dubos, of the Rockefeller Institute of Medical Research. Although it is highly insoluble, its use after operative procedures locally has greatly lessened postoperative complications and discomfort. As its name implies, it is bactericidal primarily against gram-positive organisms.[26] Penicillin, the byproduct of a fungus, *Penicillium notatum,* was discovered by Alexander Fleming, an English bacteriologist, in 1928. This drug has added advantages in that it is soluble and therefore may penetrate tissue to a greater extent, with the further advantage of being neither toxic nor irritating. It is exceedingly effective in combating staphylococcic infections and is equally effective against the aerobic and the anaerobic streptococcus and the pneumococcus.[27] Neither of the drugs, however,

has been marketed, although indications are that they may be released in the near future. It is hoped that their application will meet with similar success in root-canal therapy, as well as in other fields of dentistry.

CONCLUSIONS

From a theoretical, experimental and clinical point of view, it is rational to conclude that in root-canal therapy the sulfonamides aid in eliminating infection.

In root-canal therapy, these drugs must be employed with two important facts in mind: 1. They may be used only in direct contact with tissue fluid through irrigation or by mixture of the powder, such as sulfathiazole, with tissue fluid in the canal of the tooth. 2. They are used only when infection of the pulp exists and especially when the infection has progressed to the periapical region.

Chemotherapy with the sulfonamides alone is not a panacea in root-canal therapy, but must be supplemented by an aseptic root canal technic.

Gramicidin and penicillin may prove even more effective substitutes for the sulfonamides as bacteriostatic agents. Their use in root-canal therapy remains to be developed.

BIBLIOGRAPHY

1. SPINK, W. W.: Sulfanilamide and Related Compounds in General Practice. Chicago: Year Book Publishers, Inc., 1943.

2. ROSEN, NORMAN: Use of Sulfonamides in Root Canal Therapy. *N. Y. J. Dent.*, 13: 143, April 1943.

3. LOCKWOOD, J. S.: *Surgery*, 10:493, September 1941.

4. ROSAMILIA, P. A.: Sulfonamide Therapy in Dentistry: A Review. J.A.D.A., 30:1707, November 1, 1943.

5. OSTRANDER, F. D.: Sulfonamides in Dentistry. J.A.D.A., 30:1830, December 1, 1943.

6. Reference 4, p. 1708.

7. Report of Committees on Chemotherapeutic and Other Agents, and Surgery of Division of Medical Sciences of National Research Council. *War Med.*, 2:488, May 1942.

8. Local Use of Sulfonamides. *Bull. Lederle Lab.*, 10:71, December 1942.

9. Reference 5, p. 1833.

10. ADAMS, F. R.: Hot Solutions of Sulfonamides. J.A.D.A., 30:59, January 1, 1943.

11. Reference 10, p. 67.

12. GOODMAN, L. G., and GILMAN, ALFRED: Pharmacological Basis of Therapeutics. New York: Macmillan Company, 1941, chaps. 56 to 59.

13. Medicine and War. *J.A.M.A.*, 119: 1029, July 25, 1942.

14. MOORHEAD, J. J.: *J.A.M.A.*, 118:712, February 28, 1942.

15. MCGEHEE, J. L.: Mississippi Doctor. 18:488, February 1941.

16. KAYNE, C. B.: Sulfanilamide Therapy Pertaining to Dentistry. J.A.D.A., 28:105, January 1941.

17. Reference 5, p. 1833.

18. Reference 10, p. 63.

19. BORDLEY, J. E., *et al.*: Local Use of Sulfonamides, Gramicidin and Penicillin in Otolaryngology. *Ann. Otol., Rhin. & Laryn.*, 51:936, December 1942.

20. DOLOWITZ, D. A., *et al.*: Prevention of Ear and Nasal Sinus Complications of Common Cold. *J.A.M.A.*, 123:534, October 30, 1943.

21. COLEBROOK, L., and FRANCIS, A. E.: *Lancet*, 1:271, March 1, 1941.

22. TAFFEL, M., and HARVEY, S. C.: *Proc. Soc. Exper. & Biol. Med.*, 45:647, November 1940.

23. STEIN, H. A.: Prophylactic Value of Sulfonamides in Traumatic Dental Surgery. J.A.D.A., 30:1922, December 1, 1943.

24. CAHN, L. R.: Study of Periapical Pathology: Its Influence on Pulp Canal Therapy. *N. Y. J. Dent.*, 12:329, October 1942.

25. Reference 10, p. 61.

26. Reference 19, p. 940.

27. Reference 19, p. 944.

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FUNCTIONAL OCCLUSAL BALANCE IN THE CONSTRUCTION OF ARTIFICIAL DENTURES

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PROSTHETIC dentistry is one of the most trying phases of all dental science. Dissatisfied patients disrupt an entire office routine and sometimes an entire dental practice. A solution to the problems of the past is here offered in the hope that it will enable the prosthetist to deliver a set of dentures in functional centric relation and functional balance, secure in the knowledge that this balance will continue over a long period.

The object of this presentation is to show, by a simple method, first that there is a definite relation between anatomic centric and functional centric position, and, second, that if a denture service is to be improved, the functional movements of the mandible must be incorporated in the finished denture.

This is not a new technic, but a collection of ideas, assembled in a workable form, as an answer to some of our prosthetic problems.

In using this procedure, a few discrepancies must first be eliminated. These discrepancies exist between the baseplates and the casts and between compressible tissue under baseplates, as the functional relations are being taken.

A known factor must be added to bring into play the muscles of mastication, as if a bolus of food were being placed between the posterior teeth. We know that the muscles exert a definite pull upon the mandible in a line perpendicular to the line of occlusion. Only when this force is stabilized and brought under definite control are we scientifically "taking the bite."

For a clearer understanding of the problems involved, consider the patient who enters the office with a "pocketful" of dentures made by different practitioners, and with the statement, "They don't fit."

This patient has lost all sense of a normal relation between the two jaws. Setting of the bases has been unusually rapid, and the dentures have become unstable in a very short time. The patient, it seems, has no control over the many positions that he allows the dentist to register as anatomic centric position, and it is not until after the dentures have been completed and the patient returns for adjustment that the registrations are found to be incorrect.

By following the procedure suggested, to overcome these errors, a return to functional position can be made as many times as desired.

I should like to digress a little to make clearer why functional balance is so important. In one case, after the dentures were completed and delivered, the patient complained of a continual soreness on the lingual aspect of the lower ridge. Here again, we find that functional centric position is beyond the previous gothic arch centric position, this proving again why we cannot use the method taught in securing centric positions. In another case, after the dentures were completed and delivered, it was found that the contact between the upper and the lower anterior teeth had

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been altered and that the lower anterior teeth must be shortened in order to make the dentures function.

The only explanation that can be given here is that functional centric position is always beyond normal rest centric position. Here, I would call attention to the findings of Ralph H. Boos, who, in an effort to find a definite vertical dimension with the bimeter, also found that functional centric position was from 0.5 to 3 mm. in front of the previous gothic arch centric positions.

The mandible swings like a pendulum, being supported by the muscles of mastication, and it is their cycle and their power point that must be considered.

Fig. 1.—Shellac baseplates with compound occlusal rims adapted.

When functional centric position is used, not only is shifting of the bases eliminated, but also the wear and abrasion from faulty occlusion are minimized.

No doubt, all have tried the extension technics of the past four years. The results for a few weeks were astonishing, but the discomfort endured by the patients was boundless, and only by removal of the extensions were we able to relieve them.

Consider what this means: Today, the patient is given a denture with stabilized bases and good retention; tomorrow, the extensions for stabilizing retention are all cut off.

I began my study of functional balance only after following the different procedures offered by various clinicians, and encountering difficulty in each instance.

Following is a résumé of the procedure used. Good impressions are the first stabilizing factor, and without them we are not able to continue.

Practically a full compound technic, Tench's and Green's, which has been in use for many years, is employed. If compound impressions have been a stumbling block, the use of a suitable vulcanite tray and the zinc oxide and eugenol is recommended; for unless it is possible to return the impressions to the mouth and definitely test them for stability, one of our obstacles has not been overcome.

Full extensions are used in both the upper and the lower impressions. The impressions are boxed and poured in hard stone material, with the water: powder ratio recommended by the manufacturer.

Brown shellac baseplates are adapted over the casts and a wire strengthener is added to the lingual portion of the lower cast for rigidity. The brown shellac baseplate is used, as the pink filler that is added in making pink baseplates detracts from their accuracy in duplicating the casts. Compound occlusal rims are added to the shellac baseplates, their width in conformity with the size of the ridge upon which they are being placed. (Fig. 1.)

As to the height of the occlusal rims, it can only be suggested that if preextraction records have been made, the amount of opening can be measured and that opening duplicated with the occlusal rims.

If the patient is edentulous, there are several formulas, with which all are familiar, for arriving at these particular measurements. Each individual has

worked out his own problem in this respect. The problems in this particular step have been solved by using the phonetic balance, as there seems to be a definite relation between the position of the jaws and the formation of words that will enable us to ascertain the correct position. This is done from the very beginning, and as the case is carried toward completion, and after the "try-in," it is again possible to check the phonetic balance. After experimentation with other means, it has been found that the comfort of the patient is assured by the above-described method.

The maxillary cast is prepared and the baseplate assembled. With an occlusal guide, the occlusal plane between the tragus and the alae of the nose is established. The maxillary cast is centered by using the median line previously established on the baseplate while it is in the mouth. A line drawn across the posterior border of the cast is extended to connect with the center of the line on the labial aspect; i.e., this line, a continuation of the median line, is extended completely around the cast. The baseplate is secured to the maxillary cast with hot wax. The mounting plate that has been made to accommodate the Gysi articulator is now assembled and attached with carding wax to the occlusal rim, following the lines established on the mounting plate to correspond with the center lines on the cast. A sheet of glass in any adjustable articulator can be used for this purpose. No new equipment need be added other than a piece of glass or a sheet of metal. (Fig. 2.)

With the maxillary cast mounted on the instrument (Fig. 3), the baseplate is now removed and we are ready to arrive at a workable position. The lower compound bite-block is heated and, the maxillary cast being in place, the patient is asked to try to close the jaws normally, the temporal muscle being observed as a guide to the vertical dimension which the patient is about to register. This is done for two reasons: to acquaint the patient with what we are trying to do and to get an idea as to the approximate opening to be established.

Fig. 2.—Design for mounting plates.

At this particular step, the known coefficient is added as an aid in securing the functional centric position. In the office, we use 16-gage sheet brass cut into three or four different sizes and widths to accommodate the interproximal space between the occlusal rims on the lower baseplate. This triangular piece of brass is held with a small pair of forceps and heated in a Bunsen burner flame, being positioned approximately 2 mm. below the preestablished line of occlusion and chilled immediately to set the compound. (Fig. 4.)

Next, a large soft piece of compound is heated and stuck to the palatal por-

tion of the upper baseplate, and a common thimble is heated and pushed into the warm compound. The two occlusal rims are placed together and the thimble is brought to approximately 3 mm. above the lower plate, establishing a definite position of closure between the two occlusal rims. Central bearing or tracing devices may be substituted for the thimble. The thimble and compound are chilled and the compound allowed to set. Sticky wax is added to the brass plate on the lower occlusal rim and a piece of sponge rubber is stuck in place. This also is chilled. A small piece of metal is placed on top of the sponge

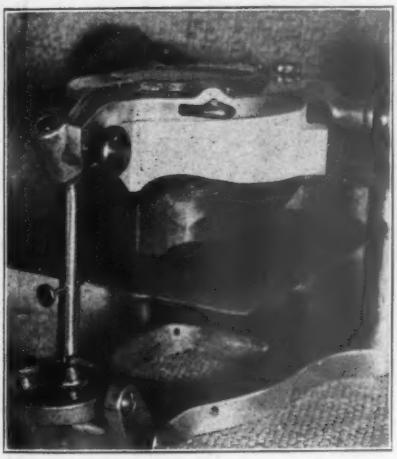

Fig. 3.—Mounting upper baseplate on articulator.

rubber and stuck in place with sticky wax, which acts as a bearing surface for the thimble. Now the mounting of the functional centric device is complete. (Fig. 5.)

The two baseplates can be assembled and tested to make sure that there is definite resistance when they are forced together.

The lower occlusal rim is now trimmed to correspond with the indentation that was formed when the two occlusal rims were brought together in the mouth, assuring a means of checking the position that was previously established. These rims are then returned to the mouth for a final check. Thus, the patient is allowed to adjust himself to the bulk and to the new environment that has been created in the mouth.

An explanation is made to the patient at this time, outlining what we are trying to accomplish. The muscle pull which must be incorporated when the jaws are brought in contact with the variable is now tested. If the temporal muscle does not respond when the patient is asked to close, the resist-

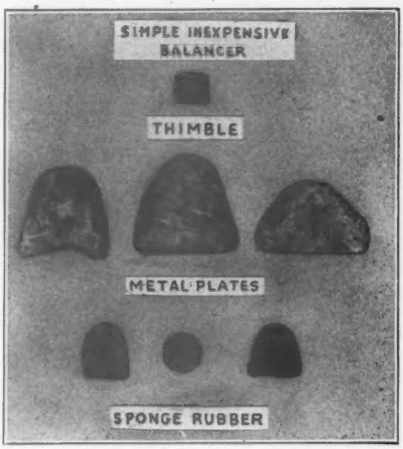

Fig. 4.—Balancer prior to assembly.

ance is increased by substituting a thicker piece of sponge rubber. The sponge rubber used varies from the porous soft spongy type to the heavy orthopedic type. The more bulky the rubber, the greater the amount of force needed to compress it.

Now we assemble, check and recheck to make sure that the vertical dimension is going to be at a point slightly below the maximum closing pressure.

The maxillary baseplate is inserted after the rims have been greased freely with petroleum jelly. A sheet of regu-

lar baseplate wax is heated and folded, making a wax strip of double thickness that is fairly soft. The blowpipe is used to heat the area which comes in contact with the softened wax. One small portion is added to the distal portion of each side of the bite-block. The lower baseplate, assembled with the soft wax added, is now inserted in the mouth and well seated, and the patient asked to try, if possible, to allow the jaw to swing normally and then make one biting excursion. This position is held for a few seconds. The patient is asked to open the jaws, the baseplates are removed, the sponge rubber is taken out and the two baseplates are assembled and chilled. The case is now ready to be assembled on the articulator in functional centric position.

Fig. 5.—Method of assembling balancer, showing relative position of thimble and sponge rubber.

The next step, the protrusive position, is needed to establish the sagittal plane. This allows the setting of the teeth so as to have a definite working side and a balancing side in the finished denture. In order to assure that a true protrusive movement is registered, a small piece of warm compound is added to the lower bite-rim and the median line marked definitely.

The next procedure is the reassembling of the sponge rubber, as in taking functional centric position. The wax is removed from the lower baseplate and the procedure repeated. As before mentioned, the upper baseplate is seated in the mouth, the lower is returned after the soft wax has been added and the patient is asked to protrude the mandible and close, making sure that the two median lines marked on the upper and lower occlusal rims coincide.

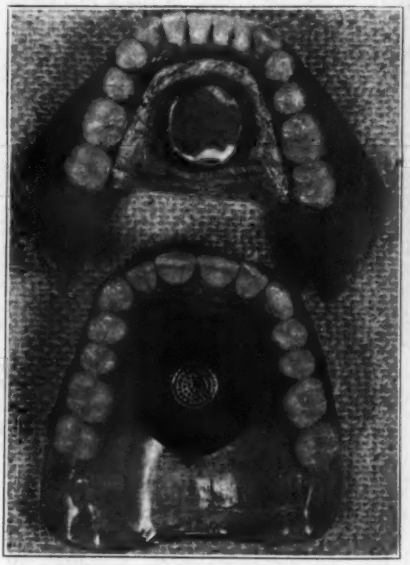

Fig. 6.—Balancer reassembled. The finished denture is ready for the final grinding.

Again the baseplates are removed from the mouth, the sponge rubber is removed, the two baseplates are assembled and chilled and protrusive registration is now transferred to the instrument. This not only acts as a check on the patient's movements, but establishes definitely whether the right and left condyles travel in the same degree.

Many of my cases show as much as 8, 10 and 15 degrees variance between the right and left condyles. How can functional occlusal balance be established unless we have these known factors?

Enough has been said about the setting up and balancing of teeth. In passing, credit should go to Dr. Gysi, whose fundamentals have stood the test of time.

Cusped teeth are used exclusively in my office. A definite cusp balance is needed in establishing the functional

Fig. 7.—Completed denture, reproduction of patient's natural teeth.

planes, and it is these individual movements that are incorporated in the finished dentures.

In order to perfect functional balance and eliminate cusp interference, carborundum paste is added to the occlusal surface and a slight amount of grinding is done at this time. This simplifies the final grinding for the patient, and any corrections that are needed to perfect the articulation can be made while the teeth are still in the wax.

After the dentures have been processed and are ready to be delivered, the unit is reassembled on the finished denture as in taking functional centric position and again the patient completes his own individual masticating cycle. (Fig. 6.)

The masticating cycle is completed by adding abrasive paste to the occlusal surface and asking the patient to chew in the customary manner. This particular operation is very important and, if completed at the time that the dentures are delivered, it will eliminate many of the return trips for adjustment because of cusp interference. I advise from time to time that this procedure be repeated. The vertical dimension of the denture is not changed by grinding, only the cusp height being adjusted to compensate for the changing condition of the tissue.

Figure 7 shows the completed case.

The dental profession must exert every effort to meet the demands of the wartime patient. There is no place in our "all-out program" for ill-fitting dentures, which add to the burdens created by a new environment.

BIBLIOGRAPHY

BLANCHARD, C. H.: Spring Center Balance, An Aid in Creating Mandibular Balance. *J. South. California D. A.*, 7:107, April, 149, May 1940.

BOOS, R. H.: Intermaxillary Relations Established by Biting Power. J.A.D.A., 27:1192, April 1940.

BRENNER, G. P.: Functional Denture Technic. J.A.D.A. 27:1873, December 1940.

Kirkpatrick Building.

THE CHEMISTRY AND PHARMACOLOGY OF SULFONAMIDE DRUGS

JOHN C. KRANTZ, JR.,* Ph.D., Baltimore, Md.

THE history of man's conquest of disease parallels the history of the sulfonamide drugs. The story begins with the year 1675, when Anthony Leeuwenhoek, linen draper of Delft, took one convex lens and set it upon another and with this improvised microscope eavesdropped upon bacteria from the water in the canal. To Leeuwenhoek, this microscope was merely a curiosity, and little did he realize that within his grasp he had the foundation stones of the modern science of bacteriology. One hundred and fifty years passed, and the scene shifted from Delft, in Holland, to Vienna.

In 1845, Vienna was the mecca of the medical world. Medical students made pilgrimages there to complete their education. As one entered the obstetrical ward in the great clinic in Vienna, an ominous sight met the eyes. Outside the ward, there were sitting scores of women in tears, for they realized that only one out of every two women who entered the doors would come out alive: the other would succumb to puerperal fever. At this time, Ignatz Semmelweis was a student in the clinic, an eager, observing student and deeply devoted to his professor of anatomy. When the latter died as the result of a dissecting wound in the arm, Semmelweis followed the body to the necropsy room and there noted the gangrenous condition of the infected arm. He saw that the lesion was similar to that condition which he had seen so often among the mothers who had died in the obstetrical ward. From this observation, Semmelweis set forth the idea that perhaps the clinician delivering the woman was also infecting her.

The clinicians said, "Semmelweis, these things are not possible." But, undaunted, Semmelweis insisted that the infection was being carried by outside hands. After much supplication, he finally induced the chief of clinic to require of every man that, before delivering a woman in that clinic, he first wash his hands in chlorine water. After this, the number of deaths in the clinic dropped in two years from 455 to 52. In spite of the results of this critical experiment, Semmelweis was doubted, and he died in despair and disappointment.

Joseph Lister, after he had risen to the position of England's greatest surgeon, visited Vienna, and some one said to him, "In yonder room, Semmelweis worked on septicemia," and Lister inquired, "Who is Semmelweis?" He had never heard of him.

In our own country simultaneously, yet independently of Semmelweis, Oliver Wendell Holmes, like a voice crying in the wilderness, was warning the medical profession, "Clean hands can carry germs." The members of the profession said to Holmes as they said to Semmelweis, "These things cannot be." But hear the trenchant remark of Holmes, "Gentlemen, truth will survive if she is run over by a locomotive, falsehood will die if it pricks its finger." We know today that what Holmes was promulgating in this country and what Semmelweis

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Read before the Ohio State Dental Society, Cleveland, November 9, 1943.

was advocating in Vienna stand as the foundations of the science of bacteriology.

In the year 1900, there were only four antiseptic drugs in the physician's armamentarium: iodine, which had been discovered by the French apothecary Courtois in 1811; carbolic acid, made famous by the immortal Lister; chlorine water, first used by Semmelweis, and bichloride of mercury, which had found its way into almost every clinic. One by one, the bacteria causing the various diseases had been discovered, during the years 1860-1900, and men were searching for compounds that would enter the blood stream and free it of invading organisms.

The history of man's struggle to obtain blood stream antiseptics goes back to darkest Africa. During his explorations there, in the middle of the nineteenth century, Livingstone observed that pack animals suffered from a disease known to natives as sleeping sickness, trypanosomiasis, which we know today is related to syphilis. He injected these animals with inorganic arsenicals and published in the *Annals of Tropical Medicine*, about 1858, his observations that the animals were benefited by this treatment.

In 1887, while working at Breslau, Paul Ehrlich read the work of Livingstone. Ehrlich believed that he could take a poisonous metal like arsenic, mercury or silver and attach it to a dye molecule that penetrates deeply into the tissues and prepare a compound which would kill the invading organisms without injury to the host who harbored the organism. Time went on and Ehrlich worked with great zeal on this problem. In 1910, he stood before a great medical meeting and said, "Gentlemen, I have a drug which will cure a mouse and I shall make another which will cure a million men." The news of Ehrlich's work was soon known throughout the world. Men came from all over the globe to work with him, and by 1910 Ehrlich with his associates had succeeded in making 606 new compounds that had never existed before. The six hundred and sixth compound, arsphenamine, or salvarsan, cured syphilis. Ehrlich wanted to synthesize a drug which, when given in one dose, would cure the syphilitic of his disease. This aim, he never accomplished. Today, we know that the treponeme develops a tolerance to the arsenicals and one must augment the arsenical treatment with mercury or bismuth, and then with potassium iodide to dissolve the gummatous tissue, in order that the arsenical or mercury may come in contact with the treponema. However, from the public health standpoint, Ehrlich achieved his ambition, for when the syphilitic is injected with the first doses of arsphenamine or the newer mapharsen, he is rendered non-infectious as far as the rest of the community is concerned.

Mapharsen, the newest of the arsenicals, the form of the drug recommended by the armed forces in this country for combating syphilis, is far better in many respects than arsphenamine. It is capable of curing the disease in a period of seven or eight weeks instead of two years. Paul Ehrlich made this compound. He studied it, but believed it would be too toxic for general use.

In 1913, Ehrlich, now a veteran, stood before a great medical congress and issued a challenge the thunder of which reverberated around the world. He seemed to realize that what he was saying would echo down through the decades. He was convinced that it was too important to couch it in his native tongue, German, so he used the universal language of science, Latin, when he asked those listening to him to produce *magna therapia sterilisans*, a great therapeutic sterilizing agent, that should kill *Streptococcus hemolyticus* in the blood stream just as his "606" killed the treponema of syphilis. Many heard the challenge. Bacteriologists, chemists and

pharmacologists all over the world endeavored to obtain this compound. In 1916, Paul Ehrlich died, without the realization of this his second dream.

In 1920, Young, White and Hill, of Johns Hopkins University, succeeded in making a new compound, mercurochrome, heralded by those enthusiastic advocates of Baltimore as the great blood stream sterilizing agent. Indeed they were warranted in some of their early enthusiasm, for, in the test tube, mercurochrome showed great promise. When, however, it was injected into the blood stream, the mercury in the mercurochrome, which is attached to a carbon atom, became ionic mercury, which is nephrotoxic, and those patients who were injected with this compound often showed signs of uremic poisoning and acute nephritis.

Prof. T. B. Johnson, of Yale, made the interesting observation that the introduction of an alkyl radical such as methyl, ethyl, propyl or butyl into the molecule of resorcinol enhances the antiseptic value of the compound. The greater the number of atoms in the alkyl chain, the more potent the germicidal activity of the compound. On this general principle, in 1927, hexylresorcinol was made.

Hexylresorcinol was an important discovery in those days. The fatal dose of carbolic acid is between 1 and 2 gm. The phenol coefficient of carbolic acid is unity. The fatal dose of hexylresorcinol is not known. One can take 5 or 6 gm. with impunity; but the phenol coefficient of hexylresorcinol is about 40, with no toxic metallic atom in the molecule. So hexylresorcinol was injected intravenously, but was ineffective, as it is inactivated by the elements of the blood.

In 1932, phenyl mercuric nitrate was tried, but was found to be too toxic for general use.

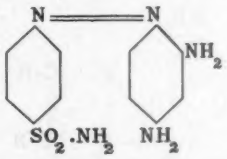
Gerhard Domagk followed the same line of approach that Paul Ehrlich had followed in the problem of chemotherapy. He took a series of dyes known as the trypan red dyes and attempted to introduce into those molecules a gold atom. Gold is very toxic to streptococcic micro-organisms. Domagk made a large number of gold compounds and performed a number of experiments on mice. He infected mice with a virulent strain of *Streptococcus hemolyticus* from man and observed that the mice died within three days. From their heart's blood, he always succeeded in isolating streptococci. Then he injected organic gold compounds and the animals lived three or four weeks. After five to six weeks, however, they began to die, but, from their heart's blood, he was unable to isolate any of the living micro-organisms. On closer examination, Domagk found that, just as in the case of mercurochrome, the gold likewise left the carbon atom and the compound became both hepatoxic and nephrotoxic, and the animals died because of the toxic nature of the metal in the dye molecule. He then left the gold out of the molecule and gave the trypan red alone, and thus kept the mice alive through their normal life span.

While conducting these experiments, Domagk permitted Dr. Foerster, of Dusseldorf, to use some of this compound, later called prontosil, on a young child suffering from septicemia. The day after the prontosil was administered, the child's temperature dropped precipitately and, in four days, she was apparently normal.

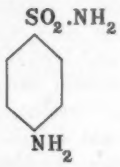
The news of that cure spread rapidly over Germany, into France, across the Channel into England, to Queen Charlotte's Hospital in the City of London, where much of the experimental work on prontosil took place. Visiting in London at that time, Long, of Johns Hopkins University, saw the remarkable results of the first days' use of prontosil in blood stream infections. In 1936, the substance was brought to this country,

and, in August of that year, it was used for the first time on the North American continent.

Prontosil, the molecule of which is large, is a red dye with the following structure:



It was soon shown by Fuller, of Queen Charlotte's Hospital, and by investigators in France and in our own country, that, in the tissues, prontosil was split and yielded the chemical substance para-amino—benzene—sulfonamide. It was further shown that the latter substance was the portion of the prontosil molecule acting against the hemolytic streptococcus. In 1937, the Council on Pharmacy and Chemistry of the American Medical Association suggested the name sulfanilamide to replace the more cumbersome para-amino—benzene—sulfonamide. The structural formula of sulfanilamide is:

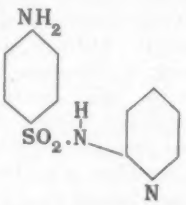


In a short time, Long and Bliss showed that sulfanilamide was effective against the meningococcus, the Welch bacillus of gas gangrene and the gonoccocus.

When sulfanilamide is injected intravenously in massive doses, there is no change in respiratory rate or in depth of respiration. The blood pressure and the pulse remain practically normal. Skeletal muscle is neither stimulated to contraction nor depressed. The smooth muscle of the intestine or the uterus is not markedly affected, if at all, by rather strong concentrations of the drug. The action of sulfanilamide does not cause thrombosis at the site of injection in laboratory animals even in massive doses. The myocardium is not involved when sulfanilamide is present in the blood in concentrations commensurate with therapeutic doses. One therefore has in this drug a comparatively inert pharmacologic substance.

Sulfanilamide is found in the blood, cerebrospinal fluid, prostatic secretion, bile and pancreatic juice and in the urine of animals given massive doses of this drug by mouth. It is disseminated through the body fluids and tissues as water spreads through a previously wetted sponge.

In the years 1937-1938, Whitby, of England, demonstrated that a new sulfonamide compound was effective against pneumococci. This new substance was called sulfapyridine. It was made by joining pyridine, a substance derived from nicotinic acid of the vitamin B_1 complex, to the sulfanilamide molecule. The structural formula of sulfapyridine is:



Prior to the advent of sulfapyridine, the mortality rate of hospitalized pneumonia cases in London was from 25 to 30 per cent. During the first year of administration of sulfapyridine, the mortality rate dropped to 7 per cent. The same results were obtained in our country. In juvenile pneumonia, in which the mortality rate is even higher than 30 per cent, with the proper use of sulfapyridine it dropped to nearly zero in many institutions.

Sulfapyridine or sulfanilamide when added to cultures of living micro-organisms has little bactericidal action. It does not coagulate the protoplasm of bacteria as does mercuric chloride or

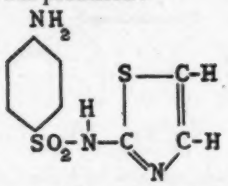
phenol. However, in the presence of sulfapyridine, the pneumococci show modification of their capsules. From these observations, it is believed that one of the most tenable explanations for the use of sulfapyridine in the treatment of pneumonia is the fact that the capsules of the pneumococci, becoming modified, are rendered more vulnerable to the phagocytic cells of the reticulo-endothelial system.

It is our belief that it is not the sulfonamide drug itself that effects the cure, but rather the sulfonamide drug in collaboration with the reticulo-endothelial system of the host. In splenectomized animals, the drugs are not nearly so effective and, in animals from which the liver has been removed, the drugs lose their effectiveness to a great degree, an indication that the activity of the drug is dependent on active phagocytosis of the host in addition to attenuation or intoxication of the micro-organisms by the drug.

When pneumococci are grown *in vitro,* as the organism develops hydrogen peroxide is formed. There is, at the same time, however, a protective mechanism elaborated by the micro-organism; namely, a catalase, which decomposes the hydrogen peroxide. If the hydrogen peroxide were allowed to become concentrated, there would be a cessation of growth of the bacteria. If one were to drop into that culture sulfapyridine or, better, sulfathiazole, the catalase would be destroyed, and thus the hydrogen peroxide would be permitted to accumulate in higher concentrations, ultimately inhibiting bacterial growth.

This appears to be one of the possibilities of the remedial action of sulfapyridine in the treatment of pneumonia.

It was observed that the use of sulfonamide drugs often produced nausea, vomiting and blood dyscrasia. Because these side effects could frequently be offset by the administration of vitamin B_1, investigators made an effort to attach this vitamin to the sulfanilamide molecule. Vitamin B_1 is made up of essentially two groups, a thiazole and pyrimidine nucleus. The thiazole group was introduced into the basic molecule, sulfanilamide, and thus sulfathiazole, which has the following structural formula, was produced:



Let us consider the advantages of sulfathiazole therapy. With sulfapyridine and sulfanilamide, we have never been able to successfully combat staphylococcic infections, but, with the addition of the thiazole group to the sulfanilamide molecule, a substance was produced that is not only active against the pneumococci, but is also quite active against staphylococcic infections. It was also found that the benign action of vitamin B_1 when given to combat the intoxication induced by sulfanilamide and sulfapyridine therapy was carried along by the thiazole group.

Administration of sulfathiazole gives rise to nausea and vomiting in about 30 per cent of virulent infections. Sulfapyridine therapy causes nausea, vomiting, anorexia and malaise in about 50 per cent of cases. Furthermore, in the sulfapyridine treatment of pneumonia, one has to acquire a concentration of the drug in the circulating blood of 10, 12 or even 15 mg. per hundred cubic centimeters. With sulfathiazole, 8, 9 and 10 mg. per hundred cubic centimeters seems to be sufficient to bring about a precipitant reduction in the temperature and a curative action.

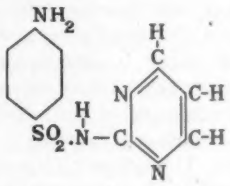
In the early days of sulfonamide therapy, the drugs were used only internally. Today, both sulfanilamide and sulfathiazole have wide local application. For example, sulfathiazole as a 5 per cent ointment in a vanishing cream base is very useful in the treatment of burns.

Our soldiers carry sterilized sulfathiazole or sulfanilamide in a small package and immediately on receiving a wound open the package and apply its contents.

Gas gangrene will not be common in this war because of the immediate use of sulfonamide drugs, which are effective against the Welch bacillus. One finds that certain skin diseases of an infectious nature, such as impetigo contagiosa, yield to sulfathiazole ointment.

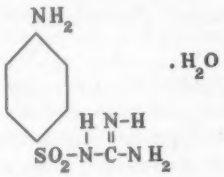
In the practice of dentistry, both sulfanilamide and sulfathiazole have been applied locally with considerable success. They are placed in tooth sockets after extraction as a prophylactic against infection. In sulfathiazole, one has the added factor of half of the vitamin B_1 molecule, which undoubtedly promotes tissue healing. The successful use of sulfathiazole has been reported in the treatment of mouth infections, such as various types of stomatitis and gingivitis.

After the success achieved with one half of the vitamin B_1 molecule, the question as to what would happen if the whole vitamin B_1 molecule were united with sulfanilamide became of interest. This has not as yet been accomplished, but the pyrimidine nucleus of vitamin B_1 has been attached to sulfanilamide, producing a compound known as sulfanilylpyrimidine, or sulfadiazine. The structural formula is:



Sulfadiazine therapy further reduced the incidence of nausea, vomiting and anorexia. Furthermore, with this drug, it appears that there need not be such high blood concentrations. From 6 to 8 mg. per hundred cubic centimeters seems to be sufficient to cure pneumonia, streptococcic septicemia and other generalized infections.

One of the latest sulfonamide drugs to take its place beside the others is sulfanylguanidine. In this compound, the sulfanilamide molecule is united with guanidine, a very simple substance, not unknown to the metabolism of the human body. This new compound has the following structural formula:



Although a more soluble compound than sulfathiazole, sulfanilylguanidine, or sulfaguanidine, is not so readily absorbed from the intestinal tract and hence finds wide use in the treatment of bacillary dysentery.

There is no doubt that the use of sulfonamide drugs has inaugurated a new era in the treatment of infectious diseases. These compounds all have in common the sulfanilamide group. In the enzyme systems of various pathogenic bacteria, para-amino benzoic acid plays an important rôle as a metabolite. The structure of this molecule in space is similar to that of sulfanilamide. When a plethora of the latter drug is present, in an infected wound, apparently it enters the metabolic processes of the bacterial cell, which in turn is unable to substitute it for para-aminobenzoic acid and consequently dies of internal asphyxia.

The rate of production of new sulfonamides by the organic chemist is prodigious. It is possible that many more infectious diseases may be cured by sulfonamide derivatives in the years to come. So, with the same gift of prophecy that Leonardo da Vinci said, "Some day men, like birds, will fly through the air and like fish will go under the sea in ships," one can predict a drug to treat successfully every human ill.

29 South Greene Street.

A PRACTICAL APPROACH TO THE PROBLEM OF VINCENT'S INFECTION IN THE ARMED SERVICES

FREMONT R. BROOKS, D.D.S., and WALTER A. WILSON, D.D.S., Brooklyn, N. Y.

WHEREVER large numbers of young men are assembled, as they are at present in the armed forces, there is to be found a high percentage of Vincent's infection of the mouth. This was true a quarter of a century ago in the first World War and, owing to failure to meet the dental health education problem, it is with us again and just as rampant.

The popular impression that Vincent's infection of the mouth first appeared as an epidemic disease during World War I seems contrary to historic recordings. Prinz and Greenbaum remind us that the retreat of the Greek army under Xenophon from an invasion of Asia in 401 B.C. was due to the fact that a great number of these warriors were plagued with sore, ulcerated and foul-smelling mouths. Similar afflictions were reported among the armies of Napoleon. Hence, the association of Vincent's infection with military concentrations cannot be limited to modern trench warfare, from which the disease received its present common pseudonym, "trench mouth."

This subject, then, which we are to discuss assumes a place of prominence among our problems here when we consider that about 5-10 per cent of inductees are afflicted in some degree with Vincent's infection, undoubtedly the most widespread of all contagious diseases with which we have to contend. While we know that, with proper treatment, fatalities are rare, the damage to morale, the loss of man-hours and of comfort and vitality and the destruction of mouth tissues from this infection are enormous. It is therefore incumbent upon us to detect its presence early and to pursue a strict and thorough course of treatment. Relief of immediate symptoms will not suffice; for if we fail to eliminate the causes, we are doomed to recurrences, with more serious consequences.

Read before the staff of the U. S. Public Health Service Hospital, Brooklyn, N. Y., August 10, 1943.

DESCRIPTION

Vincent's infection of the mouth, as we have all probably observed it in some form, is characterized by acute inflammation of the gingivae accompanied by swelling of the gum tissue surrounding the teeth, with excessive bleeding on the slightest pressure. The interdental papillae, that conical portion of gum tissue between the teeth, lose their firm appearance and become soft and slick. Necrosis of the cervical epithelium follows and there is development of a pseudomembrane, often covering the mucous membrane of the whole mouth, which is constantly peeling and being re-formed. The necrotic ulcerative process spreads with varying rapidity into the deeper and adjoining tissues. The appearance of the tissues resembles that of a tissue subjected to the action of a strong corrosive chemical. The ulcerations present ragged, irregular borders and often the alveolar bone crest is exposed. There is a characteristic putrid

odor that, to the clinician with a trained nose, almost seals the diagnosis as the patient enters the room.

In addition to the local symptoms, there is often a swelling, with tenderness, in the region of the sublingual and the submaxillary lymph glands and a temperature from 100 to 104° F. may be observed. There is usually an evident toxicity, and because of the local pain and foul taste in the mouth, the patient refrains from food and water and, if the disease is prolonged, develops malnutrition. Ulceration may also attack the pharynx and respiratory tract.

The onset of Vincent's infection of the mouth in the acute form is rapid. The incubation period has not been established, probably because of the presence of the supposedly causative organisms in practically all mouths.

In the chronic type, many of the above-mentioned symptoms may be absent, but there are always inflammation and excessive bleeding of the interproximal gingivae and progressive destruction of the interdental papillae, giving a punched-out appearance between the teeth.

Frequently, we find Vincent's infection superimposed on pyorrhea alveolaris. Such a condition greatly complicates the oral hygiene features of treatment.

Many of the cases seen at this hospital have their origin in the third molar region in the soft tissue around partially erupted third molars. The age group, 17-25, makes this a predominant factor. It is difficult to keep these areas clean at best, and a filthy mouth is just a natural incubator.

In itself, of course, the infection need not alarm the dentist, but when present in large numbers of the fighting personnel, it assumes a prominent place among dental problems and needs be dealt with continuously, vigorously and efficiently. It is a robber of energy, time and morale of men who are so necessary to the war effort, and thereby it becomes a menace to the all-out prosecution of the war. It is the more regrettable that it is a problem at all when one realizes that it is caused almost entirely by neglect of oral hygiene.

Our experience here, where we furnish dental services for many thousands of Coast Guard and Maritime Service trainees, demonstrates that, in large masses of men, the disease can be kept under control and that the individual cases need not be prolonged over many days or be allowed to remain as chronic infections.

In describing our method of coping with the problem, if we were merely to say "oral hygiene," we would undoubtedly tell 90 per cent of the story. But it is not quite so simple. These men—in most instances, just boys—come to us from all sections of the country, from all walks of life, representing a cross-section of American youth. All have had considerable American schooling, and yet most of them seem to have had little or no education in dental hygiene. Strange, is it not, for such a condition to exist in a country so advanced in the art of dentistry? That fact, coupled with the carefree attitude of youth away from home with no parental ties and on a new adventure in a new environment and under a busy training routine, is liable to create a tendency to skip some items of personal care unless steps are taken to furnish guidance in this direction.

The need for large numbers of men in the various services has made it necessary to accept inductees without great concern for dental requirements when other physical qualifications are met. Therefore, the dental problem within the services becomes one of attempting to institute dental care that will provide comfort and freedom from infection which would be a liability to the general health and efficiency.

The training period being short, it is incumbent upon us to discover early those needing immediate treatment. A dental officer is placed on the examining

line of the induction station and a mouth mirror examination of every mouth is made. Those requiring immediate or urgent care are referred to the dental clinic within their first day in uniform. Chief among the conditions considered as requiring immediate attention is Vincent's infection, and all cases, from those of extremely filthy mouths with gingivitis to the acute and chronic Vincent's cases, require immediate treatment. Thus, many potentially acute cases are prevented, and the early detection of incipient cases curtails the spread of the disease and shortens the time of treatment.

After a complete examination at the dental clinic, the patients needing oral hygiene instruction or any gum treatment are referred to the periodontia department before any other treatment is instituted. Groups of three to six are given a five-minute talk by a dental officer in an intimate, friendly manner, emphasizing the importance of mouth hygiene, the dangers of neglect and methods of caring properly for the teeth and gums. The interest manifested by 90 per cent of these boys is both amazing and encouraging, for it is the exception to find a trainee who has ever before been seriously instructed in mouth care.

This is not so astonishing when we realize, from our experience in private practice, how careless in this regard are people of high intellect and education. People including the clergy, school teachers, executives and, yes, even some medical and dental men, who otherwise know the need of cleanliness, come to us with mouths not fit to receive food. Decomposed food forming a perfect frame about the gum line of every tooth—a perfect area of incubation for all manner of disease germs—is a common picture. Hence, we can be sympathetic with the ignorance of these boys as to the importance of a clean mouth, and so we endeavor to exert a kindly influence in their problem. We solicit the cooperation of all of this staff in promoting our oral hygiene program among these boys at every opportunity.

In the handling of thousands of patients, it is understandable that we see all types and stages of Vincent's infection, from the mild incipient cases to the advanced acute ulcerative type with gross destruction of tissue. The results of our method of treatment are uniformly good, but they depend largely, of course, on the extent of patient cooperation. A patient is not dismissed until all symptoms are eliminated, and each is impressed with the great necessity of continuing the care of his mouth if he desires to prevent a recurrence of the disease. By the time treatment is completed, a large percentage are so pleased with the effects and feeling of a clean mouth that an interest in oral hygiene for their own individual comfort and welfare is firmly established. The educational benefits of this treatment are valuable to the future dental and general health of our nation, as well as a source of great satisfaction to the dentist.

"Thousands of mouths showing pink glistening gums which were once dull and raw masses of necrotic flesh" sounds like a dentifrice "ad," but it is proof of the possibilities of thorough oral hygiene measures and treatment.

Few recurrences are found, but life being heir to many weaknesses, there are bound to be some who lapse into carelessness, and we can say that with recurrences, there is definite evidence and usually an admission of relaxation in the hygiene program. A second lecture and course of treatment will help many, but human nature being thus, there is no cure for him who is unwilling to help himself. Fortunately, these represent a small percentage, less than 1 or 2 per cent in our experience.

TREATMENT

To acquaint you with the treatment of Vincent's infection as followed in this

clinic, it might be well to set forth the routine as prescribed for an individual case. When the patient arrives at the dental clinic, he is directed to an examiner, who diagnoses the case and recommends treatment. If the patient has infected gums or mucous membrane, he is immediately sent to the periodontia department, where he embarks on a formal régime of treatment.

This begins with the above-mentioned lecture on oral hygiene and dental health education, in which an attempt is made to inform him, in lay terms, of the nature of mouth infections and the importance of oral cleanliness. He is told, for example, that gingivitis is a gum disorder affecting that part of the gums immediately surrounding the necks of the teeth, and that its symptoms are swelling, bleeding and soreness of the parts involved. He learns also that this is a common forerunner of a more serious disorder called Vincent's infection, or trench mouth, which is caused by specific bacteria and which results in the destruction of gum tissue, most frequently in the interproximal spaces, but may spread to include the entire mouth and throat.

The lecture is designed to create in the patient an interest in giving his mouth better care than he has ever given it before. To this end, he is informed that such a condition as he is afflicted with usually results from a neglect of the mouth and that, to effect a cure, it is necessary that the mouth be kept in as clean a condition as possible at all times. This being the case, he must assume 90 per cent of the burden of care, leaving the remaining 10 per cent to the dentist in charge. He is advised as to the type of toothbrush to buy; i.e., one that is small, and has stiff bristles so spaced as to make it possible to work them between the teeth. He is advised to get two such brushes and alternate their use so as to have a dry, stiff one for each brushing. On demonstration models, he is shown the proper method of using the toothbrush.

The technic of brushing which the demonstration is designed to show is as follows: The bristles are first placed flat on the buccal surfaces of the upper molars, so that the tips come just to the gingival margin. The mouth is partly closed and the bristles of the brush are rolled firmly downward toward the grinding surfaces. The same procedure follows for the remaining teeth, upper and lower, except that, in the latter case, the bristles are pointed downward and the sweep is upward. It has become a slogan of our clinic—"Brush down on the uppers and up on the lowers." The occlusal surfaces are brushed with a simple back-and-forth stroke and the lingual surfaces of the anterior teeth are cleaned by a one way stroke away from the gums with the length of the brush. The patient is warned that he must not injure his gums while brushing, to avoid the risk of spreading the infection through irritation. Twice a day is the minimum number of times for brushing his teeth, once in the morning after breakfast and once again at night, particularly before retiring so that no food particles will remain lodged between the teeth during sleeping hours. Each brushing should be continued for three minutes by the clock, or eight to ten strokes in each section.

Care is exercised to point out that cleanliness of the interproximal spaces is most important and that it is essential to spend considerably more time in these areas at each brushing than he has ever felt necessary before. The lecture further emphasizes the fact that the patient himself is actually giving the treatment, and therefore the act of brushing is not just a mere ritual to follow and be dispensed with as quickly as possible, but instead is a major part of his treatment. The patient is also warned against excessive smoking and the use of alcohol while under treatment.

The next phase of the treatment, which usually is given at the same appointment, consists of gross scaling. At this time, only those deposits that can be safely removed without irritating the soft tissues excessively are removed. This naturally exposes hitherto hidden parts to the air and, at the same time, allows the medicament to penetrate deeper into the actual site of the infection. The gross scaling is followed by a thorough spray of hydrogen peroxide, after which viogen is applied liberally to the teeth and gums. This is a dye which colors the tissues of the mouth a deep blue, the staining effects resembling those of eating a generous piece of blueberry pie.

The formula for viogen is:

Brilliant green, 1 gram
Crystal violet, 1 gram
50% alcohol q.s. 100 cc.

To apply this, cotton rolls are inserted and the teeth and gums are dried thoroughly with warm air, care being exercised to prevent hemorrhage. Viogen is applied liberally on the surfaces of the teeth and gums with a pledget of cotton and, because of its low surface tension, it penetrates evenly into the gingival crevices and interproximal spaces for a considerable distance. Chromic acid in strengths of 1, 5 and 10 per cent is occasionally used at the discretion of the operator, being applied by depositing small amounts in the interproximal spaces, with care to maintain dryness of all surfaces. To further aid in the personal care of the mouth, the patient is given a quantity of sodium perborate and instructed to use it as a mouthwash several times a day, by vigorously forcing it between his teeth.

At the next and subsequent treatments, deep scaling of all deposits of calculus is instituted, treatment continuing until the teeth are thoroughly cleaned and polished and all symptoms terminated. The employment of dental hygienists to effect a final thorough prophylaxis greatly increases the treatment capacity of the periodontia department. Usually, we can expect relief of acute symptoms within twenty-four hours of the initial treatment, and severe cases in which the cooperation of the patient is good are cleaned up in a week or ten days. This is a far cry from the results obtained during and immediately after World War I. For many years, it was thought that no prophylactic measures such as freeing the teeth of calculus or even brushing the teeth should be indulged in until all acute symptoms had subsided. Faith was placed in a few specific drugs. The result was endless treatment and great destruction of irreplaceable mouth tissue, with pyorrhea involvement. With our present knowledge, many cases can be cured by means of the toothbrush alone.

We have not gone far into the bacterial phases of the disease; for while it has been stated that the fusiform bacillus and the spirochete of Vincent are the active organisms, it is now known that others are involved and the organisms are active only in a medium of filth. Hence, we have not found it necessary or practical to take smears for diagnosis or determination of the cure; for smears from mouths free of the infection also would usually show positive cultures.

In the more severe cases of Vincent's infection, which often require hospitalization, the Box treatment frequently is resorted to, consisting of first drying the mucous membrane with warm air and cotton rolls, then painting Churchill's iodine over necrotic areas with a cotton applicator, and applying 35 per cent silver nitrate solution over this in the same manner. Care must be exercised to prevent the silver nitrate from coming in contact with healthy tissues, as this would result in severe and unnecessary cauterization, adding to the discomfort of the patient. Only those areas that

are covered with necrotic patches should be so treated.

Some have advocated injections of arsenicals, reporting some success with their use, but we believe that less drastic medication is as effective and is preferable. We do, however, prescribe nicotinic or cevitamic acid by mouth in our hospitalized cases as an adjunct to local measures. We are not prepared to make any claims as to its contribution to cure.

To the average private practitioner, our treatment may appear to present a standard quite incapable of attainment, and we are well aware of the difficulties entailed in securing adequate patient cooperation in private practices. However, the purpose of presenting this routine here is to demonstrate a feasible method of treating Vincent's infection when the dentist has a firm control over his patients. Control of our patients is obtained in several ways and, in gaining it, full use is made of psychology. For example, viogen is employed, not alone for its medicinal properties, although it does have therapeutic merit, but also for its psychologic value. There is evident a great desire on the part of the patients to rid themselves of the blue discoloration of their teeth, because of their pride in personal appearance. There is thus created an extra stimulus to increased toothbrushing. In almost 100 per cent of cases, the patient will return with a clean mouth, evidencing an honest attempt at oral hygiene and at following instructions.

Then, too, military discipline is enforced here as in all other departments, and it also is an important factor in gaining control over the patients. To begin with, the enrollee undergoes regular and systematic routine day in and day out, so much so that definite patterns of habit and thought are established. There are set times when he must do certain things, or be at certain places, and it is only natural that there are specific times when he must attend to the care of his mouth. Since each dentist is a commissioned officer, his instructions have the force of a command which must be respected by all enlisted men. Threats of loss of liberty or other disciplinary action are seldom necessary in gaining control over enlisted men. This control, however, is very important in the treatment of a disease which is contagious and the cure of which depends so much on the cooperation of the patient.

RESULTS

In the treatment of thousands of cases, the average number of treatments per case is 3.5; and in severe cases involving gross destruction of mouth tissues and ulcerations in the throat, seldom do we need to hospitalize the patient for more than eight to ten days.

CONCLUSION

Vincent's infection of the mouth is primarily a disease of filth. It can be quickly cured by instituting thorough prophylactic measures including proper toothbrushing, deep scaling and removal of all deposits from the teeth. The use of viogen and the Box treatment, and of sodium perborate as a mouthwash, has proved effective. Vincent's infection of the mouth can be kept under control in large masses of men.

We urge all members of the staff to cooperate in seeing that all suspected cases are referred quickly to the dental clinic and to aid us wherever possible in promoting oral hygiene.

U. S. Public Health Service Hospital.

SKELETAL FIXATION SPLINT IN MANDIBULAR FRACTURES AS AN AID TO EARLY DENTURE CONSTRUCTION

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DURING this period of war and defense activities, the mission of the Naval Medical Corps, of which the Dental Corps is an integral unit, is applicable to all—"To keep as many men at as many guns as many days as possible."

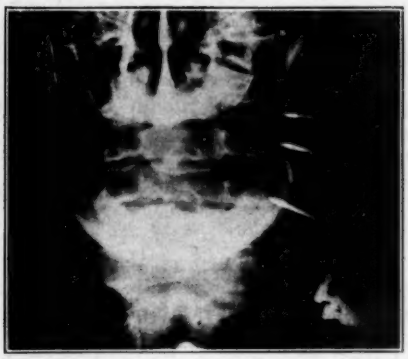

Fig. 1.—Splint in place. (March 27, 1943.)

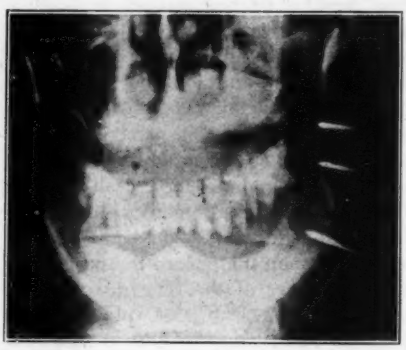

Fig. 2.—Splint in place and upper and lower dentures constructed. (April 16, 1943.)

Any procedure, method or appliance that will reduce the time away from any position, whether defense or military, is a direct contribution to the effort now being made. The use of the skeletal fixation splint in fractures of the mandible has been and is indeed a direct contribution to the reduction of time lost by the patient as a casualty. The appliance permits normal masticatory function and also eliminates any chance of mishaps arising from the closure of the teeth by wire or other appliances placed within the mouth. It allows the patient to carry on his work without pain or discomfort while the fracture is healing. Also, during this period, dental restorations or replacements may be completed, and the total sick days of the afflicted person be shortened.

The splint is especially adaptable aboard ship where *mal de mer* is prevalent. The patient is not prohibited, as by other appliances, from opening the mouth in case of vomiting, this eliminating the possibility of aspiration in cases of seasickness.

In the following case, full upper and lower dentures were inserted seventeen days after the skeletal fixation splint was placed on the fractured mandible

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and nineteen days after the fracture occurred.

REPORT OF CASE

March 25, 1943, M. J. T., white, aged 56, weight 180 pounds, was admitted to the U. S. Naval Hospital, Philadelphia, Pa., with a diagnosis of fracture of the mandible (left).

Fig. 3.—Appearance after removal of splint, thirty-four days after application. The fracture line and resorption area around the pins are evident. (May 3, 1943.)

Fig. 4.—Appearance four and one half months after removal of splint. There is filling in of new bone in the fracture line and in areas where pins were inserted. (September 28, 1943.)

March 26, an x-ray picture showed fracture of the edentulous mandible (left), forward of the angle, with displacement.

March 27, a skeletal fixation splint was applied.

April 1, an x-ray picture showed the fractured fragments held in place by the skeletal splint. The position and alinement were excellent.

April 16, full upper and lower dentures were completed and inserted, seventeen days after appliance of the skeletal splint and nineteen days after the fracture occurred.

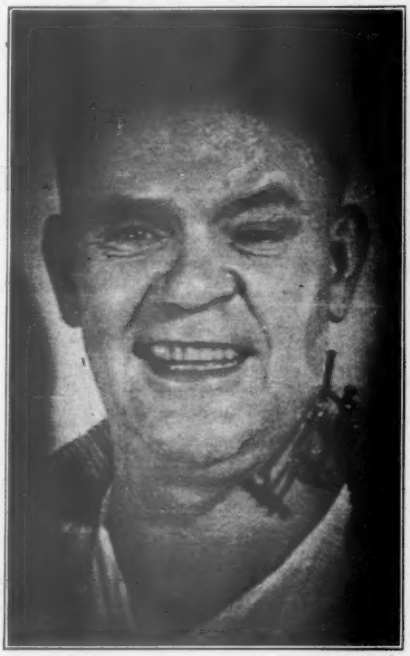

Fig. 5.—Splint in place and dentures inserted. (April 16, 1943.)

April 29, an x-ray picture of the fracture of the edentulous mandible showed no change in the excellent position and alinement of the fragments. The splint was *in situ* and the patient was wearing the dentures.

May 3, the skeletal splint was removed. The splint had been in place thirty-four days.

May 7, an x-ray picture of the fracture of the edentulous mandible made after removal of the splint showed no change in alinement and position of the fragments. The fracture line and resorption of bone around the splint pins were evident.

September 28, an x-ray picture taken four and one half months after removal of the splint showed a very faint fracture line and filling in of the resorbed bone around the pin positions.

The use of the skeletal fixation splint allowed full upper and lower dentures to be completed and used by the patient two and one-half weeks after the fracture and approximately two and one-half weeks before the appliance was removed. A saving of at least three weeks in time as required by any other method of reduction was gained in construction of the dentures. At no time was masticatory function denied the patient, and three weeks' use of the dentures was gained while healing was in progress. There was virtually no pain or discomfort, and mouth hygiene was easily maintained.

U. S. Naval Hospital.

Note: All assertions and opinions expressed in this article are those of the writers and are not to be construed as official or as reflecting the views of the Navy Department or the Naval Services at large.

CIVILIAN DENTISTRY IN WAR-TIME

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INTRODUCTION

A LARGE number of dentists formerly in civilian practice have joined the armed services in order to make it possible for officers and enlisted personnel to receive the dental care they need. There are now indications that there will not be enough dentists or dentist work-capacity left to give civilians all the dental service to which they have heretofore been accustomed; for the dentists remaining to serve civilians are now, in the main, older practitioners, who are already spending longer hours in their offices, more of their working time at the chair, treating more patients and being forced by the pressure of circumstances and their own physical limitations to give each patient less chair-time than they formerly did. That situation will be intensified by the further withdrawal of young dentists from civilian practice. What will be the effects? Just how much has war affected the practice of dentistry among civilians in this country? What remedies are there, and which of them can be developed best?

This paper will attempt to answer some of these questions.

In order to obtain the information needed for that purpose, it was necessary to canvass civilian dentists. It was obviously impossible to ask every one of them to report on his work in detail, but it was entirely practical by a questionnaire-sampling procedure to get good returns from a representative group scattered over the country, in cities, towns and villages. This report is based on 1,442 replies from dentists considered as representative of white civilian practitioners in the United States in 1943.

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METHOD

The Survey Form.—A survey form was designed and sent to approximately 3,000 dentists. The form provided for recording the following items of information for the week February 8 to February 14, 1942, and the corresponding week a year later, February 7 to February 13, 1943:

1. The number of hours spent (a) in the office, (b) at the chair treating patients, (c) in the laboratory of the office and (d) on the other work, such as educational talks with patients, clerical work and all other time in the office.

2. The number of different patients seen in the office and the total number of patient-visits.

3. The number of patients residing outside the limits of the city in which the dentist practiced.

4. The time of day when the office was usually opened and that at which it was usually closed.

5. Whether the dentist employed one or more dental assistants or hygienists.

6. The number of dental chairs used in the office.

7. The maximum number of hours that the dentist thought he could spend

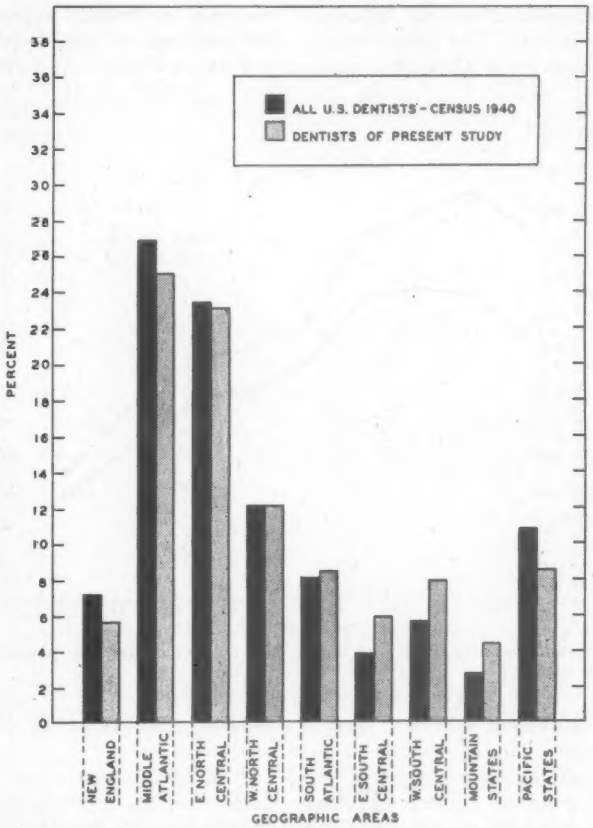

Fig. 1.—Comparison of geographic distribution of dentists enumerated in 1940 Census with that of sample of dentists included in present study.

(a) in the office and (b) at the chair.

Most of the 1,442 dentists returning the form answered all the questions, and all answered one or more of them.

The sample of dentists, which included both members and non-members of the American Dental Association, was selected with the assistance of Mr. Melvin L. Dollar, of the University of Michigan (formerly Secretary of the Committee on Economics of the American Dental Association). The sampling procedure took account of all factors usually considered in such a selection: size of city, population density, volume of demand for service, economic status, etc. The sample included a few female dentists and a small proportion of Negro practitioners, but the present report concerns only white male dentists, who form the major portion of all practitioners in the United States.

Distribution of Dentists in Sample.—Figure 1 compares the geographic distribution of the dentists who returned the forms with that of all dentists enumerated in the 1940 Census. The New England, Middle Atlantic and Pacific areas were slightly underrepresented in the returns; the East-South Central, West-South Central and Mountain States were a little overrepresented; while approximately proportionate representation was obtained in the returns from the East-North Central, West-North Central and South Atlantic areas. On the basis of these findings, the dentists returning the survey form may be considered a fairly representative geographic sample of the dentists enumerated in the Census of 1940.

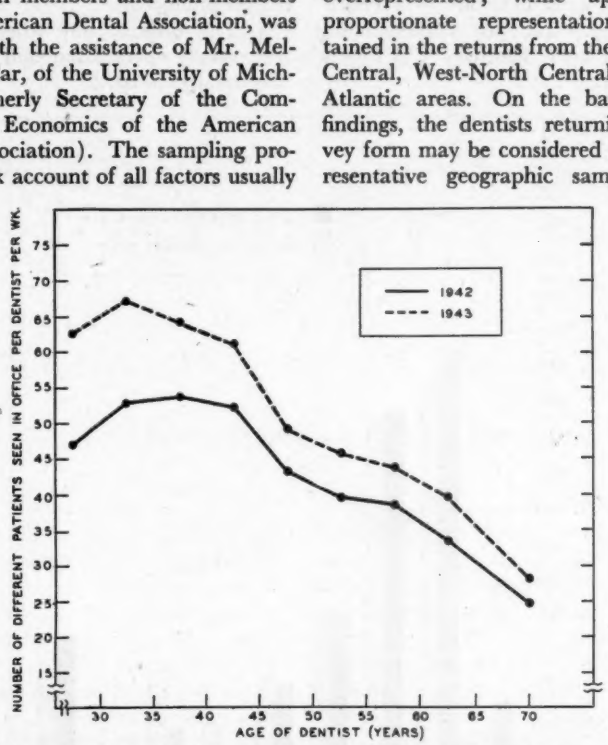

Fig. 2.—Relationship between age of dentist and number of different patients seen in office per dentist per week.

It is of interest to note that the returns were not representative of the age distribution of dentists enumerated in peace-time (1940), as is indicated in Table 1. The returns represented proportionately fewer young dentists and more old ones than were enumerated in 1940. Obviously, that finding reflects the fact that, by February 1943, a major portion of dentists under 35 years of age had already joined the armed services.

CHARACTERISTICS OF PRACTICE IN 1942 AND 1943

Office-Week.—In 1942, the office-week for dentists was on the average nearly forty-seven hours. A year later, it had increased by about 6 per cent, to fifty hours. As is shown in Table 2, the time a dentist spends in his office is related to his age; that is, in general, as the dentist grows older, he shortens his office-week. In 1943, dentists under 40 years averaged about fifty-three hours a week in their offices, and those from 40 to 60 years spent about fifty hours, while those over 60 averaged forty-five hours a week in their offices. For any given age, the office-week was longer in 1943 than in 1942, but the difference between the two years was greater for the young dentists than for the older men.

Chair-Week.—A dentist spent a little more than thirty-four hours working at the chair in the survey week of 1942, but in the corresponding week a year later he worked nearly thirty-eight hours. (Table 2.)

With increasing age, the chair-week decreased in both 1942 and 1943. In the latter year, dentists under 40 years old averaged about a forty-three hour chair-week, and those between 40 and 60 averaged thirty-eight chair-hours, but dentists aged 60 years and over worked fewer than twenty-nine chair-hours. It may be noted that the younger dentists had increased their chair-week in 1943 over that of 1942 to a greater extent than did the older dentists.

Weekly Patient-Load.—The dentists averaged about forty-four patients in one week in 1942, but a year later had increased their weekly patient-load by nearly 18 per cent, to about fifty-one patients. As is shown in Table 3 and Figure 2, the weekly patient-load is inversely related to the dentist's age. Dentists under 40 years of age averaged more than fifty patients in the survey week of 1942 and more than sixty in the corresponding week of 1943. On the other hand, those over 60 years of age averaged fewer than thirty-four patients a week in 1942 and fewer than forty a week in 1943. In the latter year, the

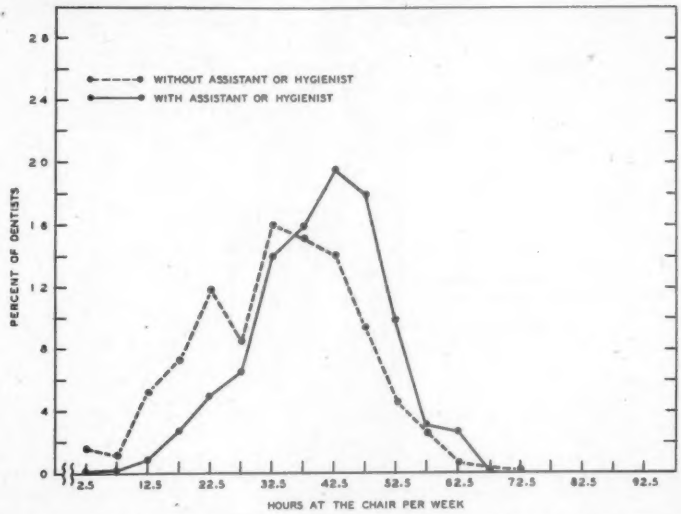

Fig. 3.—Percentage of dentists who spent specified numbers of hours at chair per week with or without assistants or hygienists.

younger dentists were therefore carrying a larger share of the increased patient-load than were the older ones.

Weekly Patient-Visits.—A "patient-visit" is defined as one dental appointment at the dentist's office. The total of "patient-visits" differs from the total of patients by the number of appointments in excess of one per person made during the survey week.

The data of Table 4 reveal that a dentist handled about fifty-five patient-visits a week in 1942 and nearly sixty-four a week in 1943. In the earlier year, a patient-visit involved about thirty-seven minutes of chair-time, while, in the later year, a patient-visit took about thirty-five minutes of chair-time. The older the dentist, the longer the duration of a patient-visit. For example, in 1943, a patient-visit ranged from about thirty-three minutes of chair-time for dentists under 30 years old to approximately fifty minutes for dentists 65 years of age and over. (Table 5.) As indicated by the material in Table 3, the number of patient-visits a week is also inversely related to the dentist's age. Practitioners under 30 years old averaged sixty-four visits a week in 1942, and

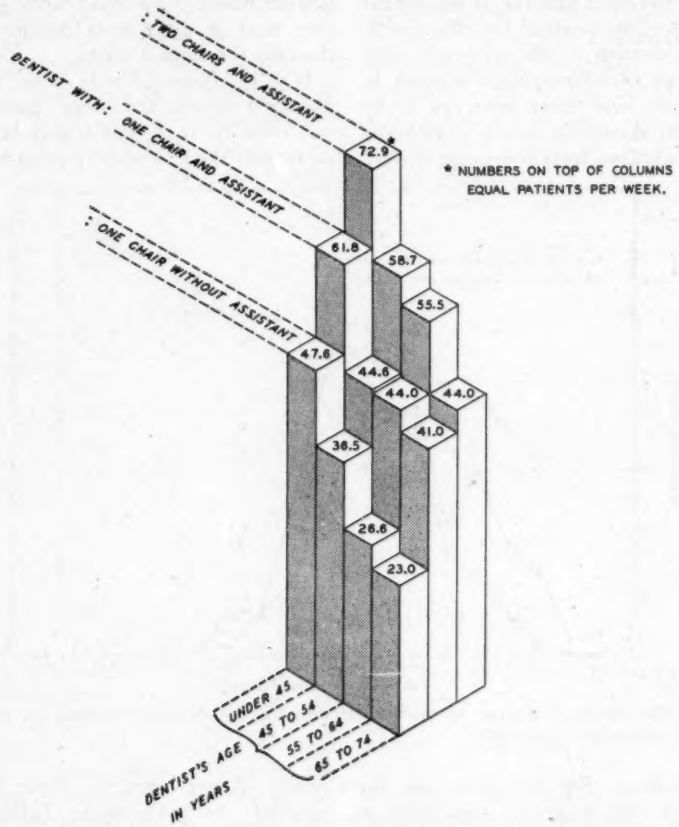

Fig. 4.—Number of different patients seen in week of 1943 per white male dentist of specified ages using specified numbers of chairs and working with or without dental assistants.

more than eighty in 1943; while those from 60 to 64 years of age had fewer than forty-one visits a week in 1942 and fewer than forty-seven in 1943. In this respect, the younger dentists have accelerated in 1943 to a greater degree than the older practitioners.

Time in the Office Spent on Activities Other Than Technical Dentistry.—The average amount of time that dentists spent in talking with patients in order to educate them in dental hygiene and to complete necessary transactions increases consistently with advancing age of dentists. As is shown by Table 5, dentists of all ages spent less time in that kind of activity in the later year, about seven and one-half hours a week in 1942, and approximately six and one-half hours a week in 1943. In the later year, however, the younger dentists had reduced their time for talking with patients and in activities other than technical dentistry more than had the older dentists.

Evening Office Hours.—It is shown in Table 6 that nearly three-fourths of the dentists did not have evening office hours after 7 o'clock. Of the remaining approximately one-fourth, that is all those who do have evening office hours, nearly one-half worked fewer than ten evening hours a week, about one-third worked from ten to fourteen hours a week in the evening, and the remaining one-sixth worked fifteen or more hours a week in the evening. That last group constitute only about 4 per cent of the whole sample of 1,351 dentists who reported on this item. Characteristically, the length of time worked in the evening by that 4 per cent is from fifteen to twenty hours; i.e., presumably three or four hours an evening for five evenings a week.

Dental Hygienists and Dental Assistants.—In accordance with common usage, a dental hygienist is considered to be a person (usually female) who has received formal training in a school for hygienists. A dental assistant is a person (usually female) who is employed by a dentist to assist in the office in the cleaning of instruments, in bookkeeping and in handling patients. Although the sample of dentists included eight practitioners who employed, in addition to dental assistants, one or more dentists, these eight practitioners are excluded from the analysis in this section of the present report.

Among all dentists reporting, fewer

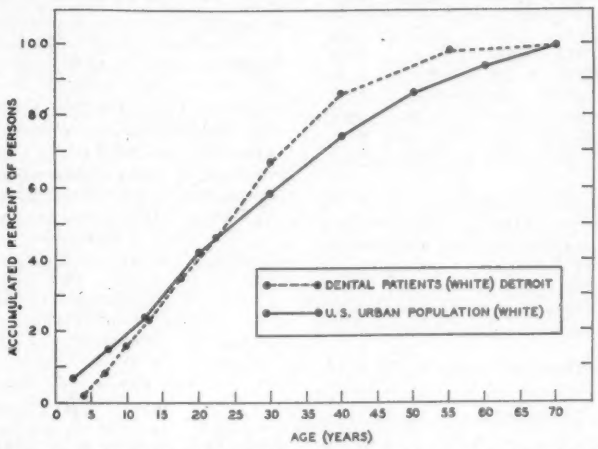

Fig. 5.—Comparison of age distribution of U. S. urban white population with that of patients seen by dentists in Detroit.

than 4 per cent employed dental hygienists. The proportion is highest in the New England area and lowest in the West-North Central area. (Table 7.)

In contrast, as shown in Table 7, more than one-half of the dentists reported employing one or more dental assistants. In this connection, the South Atlantic area leads in that nearly 69 per cent of the dentists employed such assistants. The lowest percentage of dentists reporting the employment of assistants was found in the East-North Central area.

Number of Dental Chairs Used.—The data of Table 8 show that more than 60 per cent of the dentists used only one

TABLE 1.—AGE DISTRIBUTION OF DENTISTS ENUMERATED IN THE 1940 CENSUS COMPARED WITH THAT OF THE DENTISTS REPORTING AGE IN THE PRESENT STUDY

Age Years	Dentists			
	Number		Per Cent	
	Census (1940)	Present Survey (1943)	Census (1940)	Present Survey (1943)
Under 35	15,722	120	22.7	8.6
35-44	21,942	447	31.6	32.0
45-54	16,222	438	23.4	31.4
55-64	10,472	259	15.1	18.5
65 and over	5,012	134	7.2	9.5
All ages	69,370	1,398	100.0	100.0

TABLE 2.—AVERAGE NUMBER OF HOURS SPENT IN OFFICE AND AT THE CHAIR IN A GIVEN WEEK OF 1942, AND IN THE CORRESPONDING WEEK OF 1943 AS REPORTED BY A SAMPLE OF APPROXIMATELY 1,350 WHITE MALE DENTISTS OF THE UNITED STATES (DATA ARRANGED BY AGE OF DENTIST)

Age Years	Hours per Dentist per Week			
	In Office		At Chair	
	1942	1943	1942	1943
Under 30	46.0	53.2	35.8	44.1
30-34	48.4	53.1	36.6	42.1
35-39	48.3	53.4	37.6	43.4
40-44	48.4	52.0	37.0	40.5
45-49	47.9	50.7	35.1	38.1
50-54	46.4	48.4	34.9	37.1
55-59	46.3	48.4	32.5	35.0
60-64	45.7	48.1	30.1	32.8
65 and over	41.6	42.8	24.6	25.5
All ages	46.9	50.0	34.3	37.7

TABLE 3.—AVERAGE NUMBER OF (DIFFERENT) PATIENTS SEEN IN THE OFFICE IN A GIVEN WEEK OF 1942, AND IN THE CORRESPONDING WEEK OF 1943, AS REPORTED BY A SAMPLE OF APPROXIMATELY 1,330 WHITE MALE DENTISTS OF THE UNITED STATES (DATA ARRANGED BY AGE OF DENTIST)

Age Years	Patients per Dentist per Week	
	1942	1943
Under 30	47.1	62.9
30-34	52.9	67.1
35-39	53.9	64.2
40-44	52.1	61.2
45-49	43.2	49.1
50-54	39.5	45.7
55-59	38.5	43.6
60-64	33.4	39.5
65 and over	24.9	28.3
All ages	43.6	51.3

TABLE 4.—AVERAGE NUMBER OF PATIENT-VISITS AND THE DURATION OF A PATIENT-VISIT IN A GIVEN WEEK OF 1942, AND IN THE CORRESPONDING WEEK OF 1943 AS REPORTED BY A SAMPLE OF APPROXIMATELY 1,270 WHITE MALE DENTISTS OF THE UNITED STATES (DATA ARRANGED BY AGE OF DENTIST)

Age Years	Number of Patient-Visits per Dentist per Week		Chair-Minutes per Patient-Visit	
	1942	1943	1942	1943
Under 30	64.0	80.2	33.6	33.0
30-34	64.2	80.5	34.2	31.2
35-39	66.2	80.1	34.2	32.4
40-44	64.7	73.9	34.2	33.0
45-49	55.5	61.6	37.8	37.2
50-54	51.4	58.7	40.8	37.8
55-59	48.7	54.9	40.2	38.4
60-64	40.9	46.6	44.4	42.0
65 and over	29.3	31.1	50.4	49.2
All ages	55.3	63.9	37.2	35.4

chair, about 33 per cent used two and fewer than 5 per cent had three chairs. The highest proportion of dentists using one chair was found in the Middle Atlantic area, while the highest proportion using two chairs was in the South Atlantic area.

In the United States as a whole, there were reported about 1½ chairs per dentist. The highest ratio of chairs to dentists was in the East-South Central area, where there were 184 chairs for each hundred dentists. The lowest ratio was in the Middle Atlantic area, where each hundred dentists had only 136 chairs.

TABLE 5.—NUMBER OF OFFICE HOURS SPENT IN ACTIVITIES OTHER THAN TECHNICAL DENTISTRY SUCH AS EDUCATIONAL TALKS WITH PATIENTS, ETC., IN A GIVEN WEEK OF 1942, AND IN THE CORRESPONDING WEEK OF 1943 AS REPORTED BY A SAMPLE OF APPROXIMATELY 1,350 WHITE MALE DENTISTS OF THE UNITED STATES (DATA ARRANGED BY AGE OF DENTIST)

Age Years	Hours per Dentist per Week	
	1942	1943
25-29	6.9	3.9
30-34	7.2	5.5
35-39	6.3	5.0
40-44	6.9	6.3
45-49	7.9	7.0
50-54	6.4	6.0
55-59	8.1	7.0
60-64	9.8	8.8
65 and over	9.3	9.1
All ages	7.5	6.6

WORK-CAPACITY AND WORK-ACCOMPLISHMENT

Office-Week.—By their own estimates (Table 9), the dentists' maximum office-week can be about fifty-three hours, although the estimates of capacity decrease as the age of the dentist increases. In 1943, the actual office-week approached rather closely that estimated by dentists of all ages. On the average, they were in their office close to 95 per cent of their full estimated capacity. The proportion of maximum office-hour capacity actually reported as spent in the office fluctuated very slightly with age.

Chair-Week.—As is shown also in Table 9, estimates of chair-week capacity decreased with the age of the dentist from a fifty chair-hour week for dentists under 30 to a forty-two chair-hour week for those from 60 to 64 years old. Dentists were working at the chair in 1943 at nearly 84 per cent of estimated capacity. The ratio of chair-time estimated as possible to the amount of time actually worked at the chair decreased rather consistently with the advancing age of the dentists; that is, the older men presumably tended to overestimate.

TABLE 6.—NUMBER AND PERCENTAGE OF DENTISTS SPENDING SPECIFIED NUMBERS OF EVENING HOURS (AFTER 7 O'CLOCK) IN THE OFFICE IN A GIVEN WEEK IN 1943

Number of Hours per Week	Number of Dentists Reporting	Percentage of Dentists
None	999	73.9
1- 4	34	2.5
5- 9	138	10.2
10-14	124	9.2
15-19	43	3.2
20 or more	13	1.0
Total	1,351	100.0

EFFECTS OF AUXILIARY OFFICE PERSONNEL AND EQUIPMENT ON DENTAL PRACTICE

The material in Table 10 and that shown in Figure 3 reveal that dentists who employ dental assistants or hygienists spend more time at the chair in a week than do those who work alone. A similar conclusion (but less marked) holds with regard to the office-week, as is also shown in Table 10. It is to be noted that the employment of dental assistants or hygienists has a greater effect in lengthening the chair-week than in lengthening the office-week.

The findings on the effect of number of chairs and employment of dental as-

sistants or hygienists on the weekly patient-load are summarized in Table 11 and Figure 4. A dentist (all ages combined) working alone with one chair sees, on the average, about thirty-nine patients a week. With two chairs, he sees about forty-nine patients. Working with an assistant with one chair, he sees about fifty-three patients a week. With two chairs, he sees sixty-four patients. If, in addition to one or more assistants, he uses three chairs, he then treats as many as sixty-nine patients a week.

Dentists who use more than one chair and those who employ assistants tend to be younger than dentists who work alone with one chair. Because the age of the dentist *per se* is inversely related to the weekly patient-load carried (Table 3), comparison of the patient-load of dentists working alone with that of dentists using auxiliary equipment and assistants is corrected for this age effect. Dentists working alone with one chair see seven and one-tenth fewer patients per week for each ten-year advance in age.

Expressed in other terms: When the one-chair dentist working alone is taken as the base, the weekly patient-load of the two-chair dentist without an assistant is approximately 25 per cent more, that carried by the one-chair dentist with an assistant is 33 per cent more and that of the two-chair dentist with an assistant is 63 per cent higher, while the weekly patient-capacity of the three-chair dentist with an assistant is 75 per cent over the base (thirty-nine patients).

It might be contended that the potential patient-load capacity of dentists who work without assistants is actually as large as that of dentists who work with dental assistants, but that the smaller load of patients carried by the dentists who work alone is the result of the fact that they are not as busy; that is, the dentists who work alone do not have as large a clientele of patients as the dentists who work with dental assistants. However, it is reasonable to assume that, in the year 1943, there were few if any dentists in practice in the United States who were not carrying a capacity load of patients. It is therefore reasonable to conclude that the use of a dental assistant definitely increases the patient-load capacity of the average dentist.

From these several findings, the conclusion can be drawn that a dentist using either one or two chairs, but with an

TABLE 7.—NUMBER AND PERCENTAGE OF WHITE MALE DENTISTS EMPLOYING DENTAL HYGIENISTS OR DENTAL ASSISTANTS IN 1943 (DATA ARRANGED BY GEOGRAPHIC LOCATION OF DENTISTS' OFFICES)

Dentists	Geographic Area									
	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific	All Areas
Number reporting	81	357	330	174	119	85	112	62	122	1,442
Number employing:										
Hygienists	7	13	8	2	4	4	3	2	4	47
Assistants	43	188	162	89	82	56	69	33	83	805
Percentage employing:										
Hygienists	8.6	3.6	2.4	1.1	3.4	4.7	2.7	3.2	3.3	3.3
Assistants	53.1	52.7	49.1	51.1	68.9	65.9	61.6	53.2	68.0	55.8

assistant, shows the highest increases in patient-load capacity per chair used. These data indicate therefore that if a dentist were to find that he could not simultaneously purchase a second chair and employ an assistant and therefore needed to choose one or the other, the employment of an assistant would tend to increase his patient-load capacity more than a second chair would. It might also be pointed out that the one-chair dentist who can both employ an assistant and secure a second chair will thereby gain the capability of treating twenty-five additional patients a week, although, considered separately, the increments total twenty-two patients—nine for the second chair and thirteen for the assistant, as noted above.

TABLE 8.—NUMBER AND PERCENTAGE OF WHITE MALE DENTISTS USING SPECIFIED NUMBERS OF CHAIRS IN 1943 (DATA ARRANGED BY GEOGRAPHIC LOCATION OF DENTISTS' OFFICES)

Number of Chairs	Geographic Area									
	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific	All Areas
	Number of Dentists									
1	53	242	214	105	46	32	67	37	68	864
2	26	103	92	61	63	40	28	23	44	480
3	2	6	18	5	9	11	9	2	2	64
4 or more	—	4	2	1	1	2	7	—	6	23
1 or more	81	355	326	172	119	85	111	62	120	1,431
	Percentage of Dentists									
1	65.4	68.2	65.6	61.0	38.7	37.6	60.4	59.7	56.7	60.4
2	32.1	29.0	28.2	35.5	52.9	47.1	25.2	37.1	36.7	33.5
3	2.5	1.7	5.5	2.9	7.6	12.9	8.1	3.2	1.7	4.5
4 or more	—	1.1	0.6	0.6	0.8	2.4	6.3	—	5.0	1.6
1 or more	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

DISCUSSION

The findings of the present study indicate clearly that the civilian dentists of the United States are working almost as much as they can; that is, they are in their offices and at their chairs for nearly that maximum amount of time which is consistent with what they consider acceptable standards of clinical practice.

As a group, the dentists available now are older than those in civilian practice before the war. Older dentists not only see fewer patients, but also spend fewer hours in the office and at the chair than younger dentists do, as is indicated by the data presented earlier in the present report. It follows, therefore, that not only has the withdrawal of the younger dentists from civilian practice had the effect of reducing the total of available dentists, but, in addition, the aggregate patient-load capacity of the remaining dentists has been diminished. Thus, there has been a decrease both in the number of dentists and in the aggregate patient-load capacity of the dental manpower that remains.

On the basis of data to be published in the near future, it is also evident that the older dentists see chiefly older patients, to each of whom they must give longer chair-time because older patients present dental problems of therapy and prosthesis that are more complicated and complex than those presented by younger patients as a group; and in view

of that characteristic of their practice, probably fewer children can be seen and treated by civilian practitioners now than was the case before the war. It is generally recognized that dentists' patients are largely adults. Support for that view is given by the data shown in Figure 5. (The material plotted in this figure was obtained from papers by Britten, Perrott and Tibbitts.[1, 2])

That disproportionate representation of adults has been commented upon frequently. In fact, dental educational programs have been aimed particularly at the situation in an effort to obtain a larger and better representation of children among dentists' patients.

Even though the importance of systematic dental care for youth has been and is widely acknowledged, adults purchase nearly all the dentist-time that is available. The children obtain relatively few services, and for sufficient reason. Since before the present war, of every five cavities developing among children each year, one was filled and the remaining four were neglected.[3]

Furthermore, the dental need which arises each year in the American population may be estimated to require for its care about twice as much dentist-time as there was available before the war. Justification for that estimate is given in detail in a recently published report.[4] For that restricted supply, adults and children had to compete. The adults secured the services to a greater extent and more frequently than did the children. There was not enough for both.

That situation existed in peacetime when nearly one-fourth of the dentists were under 35 years of age. Now, in wartime, among the civilian dentists remaining, fewer than one-tenth are under that age. It follows, therefore, that the likelihood of children being served by a dentist is less now than before the war, and it may be expected to decrease further as more young men are withdrawn from civilian practice.

The present report describes the dental situation as of 1943. Civilian dental practice has been disturbed, and the indications are that children in particular will bear the brunt of the consequences. What remedies can now be suggested to prevent further disruptions or, better, to encourage improvement?

TABLE 9.—HOURS IN THE OFFICE AND AT THE CHAIR PER DENTIST PER WEEK, AVERAGE MAXIMUM CAPACITY, AVERAGE ACTUALLY WORKED AND PERCENTAGE OF REPORTED CAPACITY ACTUALLY SPENT IN THE OFFICE AND AT THE CHAIR, BY A SAMPLE OF APPROXIMATELY 1,350 WHITE MALE DENTISTS OF THE UNITED STATES (DATA ARRANGED BY AGE OF DENTIST FOR A GIVEN WEEK IN 1943)

Age Years	Hours in Office per Dentist per Week			Hours at Chair per Dentist per Week		
	Average Maximum Capacity	Average Worked	Percentage of Capacity Worked	Average Maximum Capacity	Average Worked	Percentage of Capacity Worked
Under 30	57.1	53.2	93.2	50.5	44.1	87.3
30-34	57.3	53.1	92.7	49.9	42.1	84.4
35-39	55.6	53.4	96.0	48.6	43.4	89.3
40-44	55.0	52.0	94.5	47.0	40.5	86.2
45-49	52.8	50.7	96.0	44.6	38.1	85.4
50-54	51.9	48.4	93.3	45.3	37.1	81.9
55-59	51.4	48.4	94.2	43.9	35.0	79.7
60-64	51.2	48.1	93.9	42.3	32.8	77.5
65 and over	44.5	42.8	96.2	37.0	25.5	68.9
All ages	52.9	50.0	94.5	45.2	37.7	83.4

One, and perhaps the first, remedy is immediate expansion of research and inquiry for the purpose of developing new operative, therapeutic and preventive methods the clinical application of which would have the effect of increasing the efficiency and effectiveness of the average dentist's chair-time. The dentist's work-load would be lightened and his work efficiency enhanced, this fact contributing in effect toward increasing the aggregate available dentist-time.

The findings of the present study illustrate perhaps the kind of information that can be developed as a result of inquiry in this field. It is clear that a significant increase in the aggregate or total patient-load capacity of all the available civilian dentists could be realized immediately, if each dentist who now uses only one chair were to secure an additional one and if those who work alone were each to employ a dental assistant.

The point might be raised that dentists who use two chairs and an assistant and see the larger number of patients render an inferior service. However, as shown in the analysis of the present report, a considerable percentage of dentists employ a dental assistant and use two chairs. It would be reasonable to assume that the type of service rendered on the average is probably as good as that within the capabilities of one-chair dentists. Discussion regarding this question among dentists frequently results in the statement that the two-chair dentist employing an assistant may well render a superior type of service because of his freedom from concern with auxiliary details in the preparation of the patient for treatment.

A second remedy is expansion of dental manpower *per se* through a training program for young men and women to the extent that there would be sufficient dentists to treat the needs of all school children at least. The civilian dentists are now older as a group, and further withdrawals of young dentists will have the effect of increasing the average age of the remaining dentists. That phenomenon, coupled with the absolute decrease in the total of civilian dentists because

TABLE 10.—NUMBER AND PERCENTAGE OF WHITE MALE DENTISTS WITH OR WITHOUT DENTAL ASSISTANTS OR HYGIENISTS REPORTING SPECIFIED NUMBERS OF HOURS SPENT IN THE OFFICE AND AT THE CHAIR IN A GIVEN WEEK OF 1943

Dentists	Dentist Assistants or Hygienists (Full or Part Time)	Hours per Dentist per Week											
		Under 10	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90–99	100 or More	Total Dentists
		In Office											
Number	With	5	3	15	65	349	279	99	37	3	5	—	860
	Without	3	8	13	69	236	147	68	19	6	—	1	570
Percentage	With	0.6	0.3	1.7	7.5	40.6	32.4	11.5	4.3	0.3	0.6	—	100.0
	Without	0.6	1.4	2.3	12.1	41.4	25.7	11.9	3.3	1.1	—	0.2	100.0
		At Chair											
Number	With	6	31	97	252	315	109	28	2	2	1	—	843
	Without	16	69	112	169	127	39	6	1	—	—	—	539
Percentage	With	0.7	3.6	11.5	29.9	37.4	12.9	3.3	0.2	0.2	0.1	—	100.0
	Without	3.0	12.8	20.8	31.3	23.6	7.2	1.1	0.2	—	—	—	100.0

of deaths and retirements among them, without a compensatory influx of new dentists, will make it more and more difficult for children of their own accord to compete with adults, who may find it necessary to compete even among themselves, for the dental services they desire.

A third remedy may involve the question of evening hours. This is especially important in relation to the provision of services to children and persons employed in war industry. Dental disease is largely an ambulatory condition which, in the main, does not prevent the affected person from attending work or school. On the other hand, the provision of dental treatment may involve the child's absence from school, or the war worker's absence from duty. For children, office hours after school are clearly the most convenient. For most civilian workers, evening office hours are suitable. Among the dentists here surveyed, only about one-fourth have any evening hours, and only about half of those work a significant number of such hours a week. On the other hand, it is to be recognized that the dentists are now working at nearly full capacity during the day and therefore could not, in addition, work the evening hours. However, if a major proportion of dentists were to shift their working hours, the result might well be to shift adults from afternoon to evening hours, so that more afternoon hours would be available for children and youths. Such an effect might contribute significantly toward a larger and therefore better representation of children among dentists' patients; a desirable change about which there would be little objection and a good deal of commendation on the part of both the profession and the public.

The ultimate remedy, obviously, is the reduction of the dentists' patient-load through reduction of the incidence of dental disease. There is promise in that direction and much upon which to base our hopes. This statement is based on recent information on the prophylactic effects of the fluoride compounds.[5-8] However, it is necessary to recognize that the amount of dental disease that now prevails and the amount that can be expected to develop next year cannot be overlooked; that is, it needs to be treated. New methods, adjustments and adaptations should be developed so that we may be able to increase the efficiency of the

TABLE 11.—NUMBER OF PATIENTS SEEN IN A WEEK IN OFFICES HAVING ONLY ONE DENTIST BY DENTISTS OF SPECIFIED AGES, EMPLOYING OR NOT EMPLOYING AUXILIARY EQUIPMENT AND DENTAL ASSISTANTS (BASED ON REPORTS FROM APPROXIMATELY 1,400 WHITE MALE DENTISTS OF THE UNITED STATES)

A One-Dentist Office	Age of Dentist (Years)												All Ages (Crude)	All Ages* (Adjusted)
	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84		
	Patients per Dentist per Week													
1 chair with assistant	65.7	66.6	65.3	57.3	48.5	39.1	42.6	46.7	44.8	34.7	—	—	52.4	52.6
1 chair without assistant	33.8	47.8	52.1	45.8	37.4	35.2	29.6	23.5	25.8	16.3	7.5	5.0	35.8	39.4
2 chairs with assistant	75.0	68.1	74.0	74.3	60.8	54.4	57.1	53.1	36.7	61.5	—	—	64.2	64.2
2 chairs without assistant	63.8	50.8	56.1	62.1	46.6	54.0	32.0	31.8	27.5	19.2	—	—	46.4	48.7
3 chairs with assistant	47.5	99.2	58.5	76.6	46.6	80.0	91.3	58.9	—42.5		—	—	68.1	68.8
3 chairs without assistant	—	—	—47.5		—	—67.5		—	—	—	—	—	57.5	66.0

*Adjusted for differences in the average ages of dentists in the several groups.

dental manpower we now have. If that is not done, the large and embarrassing disparity between dental needs and dental care which has prevailed among the population in the past will become even larger in the near future.

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BIBLIOGRAPHY

1. BRITTEN, R. H.: Study of Dental Care in Detroit, Mich. *Pub. Health Rep.*, 53:446, March 25, 1938.

2. PERROTT, G. ST. J.; TIBBITTS, C., and BRITTEN, R. H.: National Health Survey, Scope and Method. *Pub. Health Rep.*, 54:1663, September 15, 1939.

3. KLEIN, HENRY, and PALMER, C. E.: Dental Problem of Elementary School Children. *Milbank Mem. Fund Quart.*, 16:267, 1938.

4. KLEIN, HENRY: Dental Needs Versus Dental Manpower. J.A.D.A., 31:263, February 1, 1944.

5. FOSDICK, L. S., and HANSEN, H. L.: Theoretical Considerations of Carbohydrate Degradation in Relation to Dental Caries. J.A.D.A., 23:401, March 1936.

6. KLEIN, HENRY, and PALMER, C. E.: Dental Caries in American Indian Children. *Pub. Health Bull. No. 239*, 1937.

7. DEAN, H. T.: Fluorine, Mottled Enamel and Dental Caries. *J. Pediat.*, 16:782, June 1940.

8. KNUTSON, J. W., and ARMSTRONG, W. D.: Effect of Topically Applied Sodium Fluoride on Dental Caries Experience. *Pub. Health Rep.*, 58:1701, November 19, 1943.

A DENTAL PROBLEM CONCERNING FLYING PERSONNEL

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INTRODUCTION

TOOTHACHE provoked by lowered barometric pressure experienced during flight to high altitudes or during simulated "flights" in altitude chambers is a relatively new challenge to members of the dental profession. Its importance lies in the fact that toothache is a rather common complaint among flying personnel, and indisposition because of it may result in failure of important missions, especially in combat. Tooth pains resulting from lowered pressure are usually relieved during descent or on return to ground level. Because they persist chiefly at a high altitude, they are unlike routine dental cases and can be corrected less easily. Success in treatment of such cases can be ascertained only by resubjection to low pressure.

The incidence of dental pain at high altitudes has been discussed more extensively in a report of April 8, 1943. Between 2 and 3 per cent of flyers have experienced toothache at high altitudes. All trainees have undergone at least one routine dental checkup under Army supervision previous to their altitude experiences. Our records clearly indicate that, at the present time, the dental profession as a whole does not appreciate the significance or, in some cases, the existence of this problem and is therefore failing to provide adequate preventive and corrective treatment.

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This study embodies 175 cases followed in detail during recent months, mostly since the preliminary report just mentioned, which was submitted to the Air Surgeon (through certain channels).

ETIOLOGY

In an attempt to explain toothache experienced by aerial personnel making test "flights" in the altitude chamber, it has been suggested that many of these patients are neurotics, the pain resulting from a psychologic reaction associated with a nervous condition and reduced barometric pressure. In the 175 patients examined, treated and reported on here, there have been definite findings of a pathologic, physiologic or chemical disturbance in all cases that were followed.

Investigations in the Navy[1] have suggested that these conditions are due either to necrosis of the pulp or to the presence of air, trapped under the filling material. The findings in this report indicate that although this may be true in many instances, other complicating factors frequently present difficult diagnostic problems and occasionally toothache is traceable to aerosinusitis.

The reaction of the tissues of the pulp chamber to various filling materials has been a common subject for observation. It has been observed (Manley, 1942, and others) that when red copper cement, zinc phosphate cement, amalgam, a temporary stopping and silicate cements are placed in deep cavities or in close apposition with the pulp, definite histologic reactions occur in the pulp and dentin. On the other hand, in cavities

filled with zinc oxide and eugenol, no serious reaction takes place, although slight changes are occasionally observed. The work of other investigators (Diefenbach and James, 1942) offers evidence in support of the experiments mentioned above.

In the cases included here, removal of the filling material showed that in 30.9 per cent of the defective teeth, the pulp was exposed. Probably, this percentage would have been much higher had the filling material been removed from all the teeth found abscessed. In only seven cases had an attempt been made to cap the pulp with an acceptable material. In many other cases, the teeth had been filled without regard to pulp exposure.

Removal of the filling material in 116 cases revealed that fifty-seven fillings had been placed with bases, only seven of which appeared to be zinc oxide and eugenol or temporary cement.

Odontitis runs a course from mild hyperemia of the pulp to complete necrosis.[2] From a clinical standpoint, the lines of demarcation of the various stages are vague, presenting a diagnostic problem especially difficult in the early stages. The condition called necrosis or partial necrosis of the pulp is easily diagnosed, but to diagnose the earlier stages is often almost impossible owing to the absence of clinical symptoms and the fact that only minor changes in the continuity of the pulp chamber are evident on x-ray examination.

Hyperemia of the pulp may result from abrasion, erosion or slight caries.[2] More serious hyperemia results from deep decay or the presence of improper filling materials in close apposition to the pulp. If this pulpal irritation remains without treatment, the pulp will become hyperemic to the extent of strangulation of the blood vessels, with resultant stasis and necrosis. It is important to diagnose early cases of hyperemia because they represent a stage of odontitis from which recovery is possible.

DIFFERENTIATION

In treating patients with odontitis, the greatest difficulty is to determine the exact source of the pain. A dependable method of locating the tooth or teeth in which pain originates has not been found. Many patients have more than one tooth with deep fillings in the area from which the pain arises. In such cases, it has been observed that the pain is most likely to originate in teeth recently filled or in those teeth containing the larger or more complex fillings, especially when the x-ray examination indicates minor changes in the pulp chamber. Except in cases of abscess, the patient's report furnishes additional evidence that is valuable in determining the source of pain. In some instances, evidence may point to a number of teeth needing attention; in which case, all must receive treatment, followed by a check flight to determine its effectiveness.

A complete dental history of the patient is important. Correlation of the data from 175 patients whose records are complete revealed that, in 65.1 per cent, the defective teeth had received dental attention during the last year. In 21.7 per cent of cases, the dental work was not so recent. Some teeth containing synthetic fillings less than 2 years old also were the source of pain. From gross oral examination, it was found that most of the fillings had good margins, some of which had been highly polished. In twenty-three of the cases, no dental work had been done in the area in question. In 32 per cent of cases, the patients reported having had some pain previous to the altitude experience. Some complained of shooting pains following the original filling, but believed that the filling did not contribute to the present malady. Shooting pains may occur in teeth with high fillings or in cases of mild pulpitis. Often, such pains cease, but, in other cases, they are a prelude to severe pulpitis and loss of the tooth. Occasionally, reports indicated a sensitivity to heat

or cold, or both, for weeks after the filling was placed. During routine recording of case histories, bits of information are frequently uncovered which might aid in locating defective teeth. In this way, exposed pulps have been found to be capped with zinc oxyphosphate cement.

The depth of the filling or its proximity to the pulp may be estimated by use of the pulp tester. Also, a comparison of the respective sensitivity of teeth in the painful area may be used as an additional aid in finding the source of the trouble. The pulp tester is held in several positions on the tooth in an attempt to determine the lowest degree of response. One prong of the tester may be placed on the filling material and the other on the vital tooth structure in the lingual or buccal groove. In the tooth that is most sensitive to this procedure, there is often some irritation of the pulp. As with other methods, results with the pulp tester are not always conclusive. Many fillings have a cement or nonconductive base and will not register hypersensitivity even though acute pulpitis may exist. If a hypersensitive tooth is not detected in the area of pain, the least sensitive tooth may be selected on the assumption that there may be present a necrosis of the nerve, an insulating base material under a large filling, a root-canal filling or a chronic abscess. Each tooth is then tested for sensitivity to heat, cold and percussion.

Sensitivity to percussion does not necessarily indicate that the tooth is abscessed, for teeth with vital nerves and hypersensitive pulps or loose fillings may also register pain in this test. This pain is unlike that from abscess in that it arises from the vibration of an irritated pulp or loose filling and not from the apex of the root. Sensitivity to heat or to cold is a symptom of pulpitis. Some cases exhibiting all three symptoms have been corrected successfully without root-canal therapy. More frequently, the three symptoms were completely absent.

Roentgenograms, although invaluable, cannot be considered as absolutely infallible in selecting the tooth causing pain. The machines, to be of much value, must be adjusted to obtain the greatest amount of contrast within the pulp chamber of the tooth. Minor discrepancies in the normal contours of the pulp chambers are indicative of present or past pulpal disturbances. Roentgenographic studies are helpful in locating abscesses, incomplete root-canal fillings and secondary dentin.

DIAGNOSIS

In the 175 cases included here, the diagnoses were as follows: 130, pulpitis; thirty-four, abscess; four, radicular cyst; two, gingivitis; five, aerosinusitis, and the cases were treated accordingly. Many teeth, on a diagnosis of pulpitis, were removed and dissected. The gross findings substantiated the diagnosis and most of the teeth removed had large areas of exposure from previous dental treatment. Some presented an offensive odor and were found to contain necrotic blood. Others showed a complete necrosis of the root-canal tissues.

TREATMENT

Although generally accepted methods of treatment for such cases are well known to the dental profession, it was found in many cases that such procedures had not been followed.

The treatment of abscessed teeth, which is well known, was carried out when the abscess was discovered. However, in a few cases, teeth had been filled recently even though the abscess probably was present at the time that the filling was placed.

Frequently, teeth were found to have been treated without consideration of the fact that placement of certain filling materials close to the pulp has a serious pulpal reaction, sometimes a complete necrosis of the tissues in the root canal. An obtundent lining or base material

should be placed in all deep cavities to avoid deleterious reactions. Zinc oxide-eugenol has been used in most of the cases submitted because it is a standard preparation and well known to the dental profession. It is probable that other obtundent antiseptic base materials would give equally satisfactory results.

Eighty-five cases were corrected by refilling or by placing a new filling in previously unfilled cavities or a lining under the filling. This cannot be considered a complete curative measure in pulpitis, but merely an effective means of assisting the hyperemic tissues to return to normal.

In sixty-nine cases, correction could be obtained only by sacrificing the tooth or teeth concerned. Thirty-four were diagnosed as abscessed, of which four were corrected by root-canal filling and apicoectomy. In four instances, a cystic condition had developed, necessitating the extraction of two or more teeth. Nine cases diagnosed as mild pulpitis received no treatment. There were two cases in which gingivitis was the apparent cause of the pain.

REDUCED BAROMETRIC PRESSURE AS RELATED TO ABSCESSES

Frequently, patients report to the clinic suffering from toothache a few hours or days after completing a "flight" in the altitude chamber without incident. They report no pain present during the "flight," yet attribute the subsequent ailment to the experience at high altitude in the chamber. This complaint is consistent with the observation that similar reactions may occur after travelers cross mountainous country by land conveyance. Necrosis of the contents of the root canal has been found in many of these cases.

As a working hypothesis, it is suggested that gases, generated as a by-product from necrotic pulp tissues within the canal and expanding under reduced atmospheric pressure, may thus expel septic material through the apex of the root into the surrounding tissues, an abscess or exacerbation of a chronic condition resulting.

PROTECTIVE BEHAVIOR OF DENTAL TISSUES IN CASES OF PULPITIS

In studying cases of pulpitis, reactions indicative of a high degree of natural protection of dental tissues have been observed. In several instances, septa of secondary dentin completely separating the apical portion of the root canal from the necrotic portion have been found.

REACTIONS OF PULP TO BASE AND FILLING MATERIALS

When certain materials appearing to have irritating qualities, such as alloys, silicate fillings, zinc oxyphosphate cement, copper cements and temporary stopping material, are placed in close apposition to the pulp, hyperemia of the pulp usually results. In hyperemic tissues, the cell walls and therefore the walls of the capillaries are more permeable, and thus an excess of fluid enters the tissues outside of the vessels themselves. During an ascent to high altitudes, with an accompanying decrease in atmospheric pressure, gases originally in solution may come out of solution, forming bubbles which, in turn, exert excessive pressure on nerve fibers of the pulp cavity, thereby causing pain. Thus, it appears possible that many toothaches experienced for the first time at a high altitude soon after fillings have been placed may be due to the omission of appropriate bases, unwise selection of filling materials, etc. In this regard, it is clear that some standard methods that give satisfactory results at ground level fail to stand the test of low pressures at high altitude. Consequently, it is not surprising that many dentists are unknowingly creating sources of toothache occurring at high altitudes. With this in view, it is suggested that those dental officers treating personnel on flying status be given special training in the treatment of aerodontitis.

The following cases give some idea of typical observations made in the dental clinic:

REPORT OF CASES

CASE 1.—This case is interesting from the standpoint of cause and prevention of pulpitis. The patient completed an uneventful training flight to 38,000 feet in the altitude training chamber before reporting to the dental clinic for a routine checking. As a part of the dental treatment, the lower right second-molar was filled, with zinc oxyphosphate cement as a base. The patient returned to the clinic later complaining of lancinating pains in the area of the right second molar. Before receiving further treatment, he was sent on another "flight" in the altitude chamber to determine the reaction of a tooth apparently suffering from pulpitis to lowered barometric pressures. Without knowing the altitude, the patient reported intense pain at 5,000 feet, becoming unbearable at 18,000 feet, so that a descent was necessary. The alloy filling and cement base were removed and replaced with a base of zinc oxide and eugenol which, in turn, was covered with a cement base and a permanent alloy filling. Later the same day, the patient was sent to 38,000 feet in the altitude chamber with no further pain.

CASE 2.—Before making any "flight" in the altitude chamber, the patient had two teeth filled with alloy. The next day, he experienced pain in both teeth during a "flight" in the altitude chamber. The fillings (deep) were removed and found to have been placed without bases. Zinc oxide and eugenol bases were provided and the fillings replaced. The case was rechecked in the altitude chamber two days later and slight pain in one tooth was reported. Twenty-nine days later, the patient flew to 38,000 feet in the chamber without pain.

AEROSINUSITIS

"Toothache" is sometimes reported in subjects having no dental disease. The findings in recent cases, not included elsewhere in this report, tend to indicate that pain apparently of dental origin may actually arise as a result of obstruction of the maxillary ostia, making it difficult for the air pressure in the maxillary sinuses to become equalized with changing atmospheric pressure. Aerosinusitis must be considered as a possible complication in diagnosis when pain is reported in teeth of the upper jaw, especially in the area of the bicuspids and molars. The history of the patient usually reveals a slight nasopharyngitis or chronic sinusitis and intense toothache experienced usually during descent in the chamber and often continuing at ground level. Some relief may be obtained by the use of an inhaler or nose drops, causing a shrinkage of the nasal mucosa with vasoconstriction of the blood vessels.

The accuracy of diagnosis where aerosinusitis is believed to be the source of trouble may be determined by another chamber "flight" after the cold or sinusitis has cleared up. If, during such a test, pain is not experienced without dental treatment, aerosinusitis may be considered the correct diagnosis.

CONCLUSIONS

1. Failure to understand dental problems of flying personnel is resulting in dental work that does not withstand the test of high altitudes, although it is satisfactory at ground level.

2. One of the earliest subjective symptoms of pulpitis is pain experienced under the low pressures of high altitudes.

3. Mild degrees of pulpitis that are not painful at ground level may repeatedly cause pain at high altitude. Under appropriate treatment, many early cases of pulpitis can be corrected.

4. Zinc oxide-eugenol, an obtundent base material, has been found highly successful in the treatment of mild pulpitis.

5. When irritating base materials are used or base material is omitted, pulpitis is intensified and the sources of pain experienced at high altitude are not eliminated.

6. For all flying personnel, the effectiveness of treatment of deep cavities and pulp exposure should be checked under conditions of reduced barometric pressure.

7. Toothache occurring during the descent, after an uneventful stay at high altitude, may be caused by aerosinusitis, especially if the patient is suffering from an upper respiratory infection. In such cases, medication is indicated rather than dental treatment.

8. Dentists responsible for the treatment of flying personnel should receive special instruction in the prevention, diagnosis and treatment of aerodontitis.

BIBLIOGRAPHY

1. JOSEPH, T. V., ET AL.: Toothache and the Aviator. *U. S. Nav. M. Bull.*, 41:643, May 1943.

2. WARD, M. L. (Editor): American Textbook of Operative Dentistry. Philadelphia: Lea & Febiger, 1940.

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"PROPHYLACTIC ORTHODONTICS" AND CHILDREN'S DENTISTRY

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OVER the years, dentists have been observing definite changes in the relative amounts of the different types of service demanded by patients. These changes are being accelerated by the war and are destined to become even more pronounced in the immediate postwar years. Dental operations which formerly took up the major portion of the dentist's time, such as full denture work, are fast being displaced by other types of service that once had a comparatively unimportant rôle in daily practice. One can point also to the manifest decrease in the number of teeth extracted today as compared to the wholesale extractions of past years. In contrast to the diminishing demand for the above-mentioned types of dental service, we can readily agree that there has been a definite increase in the number of child patients seen in dental offices.

Increasing appreciation of dental care on the part of the public has brought about also a change in the character of the dental patient and in the type of service actually demanded of the dentist. Latterly, there has been a growing demand for a new approach to children's dentistry. In addition to the well-recognized need of filling children's teeth, it is now felt that dental care of children should aim to ultimately bring about the establishment of the normal occlusal relationship in the permanent dentition. Consequently, it has become necessary for the dentist to modify his practice and to prepare himself to render a new service.

Today, there is a growing demand on the dentist for advice on malocclusion of the teeth of children. The dentist can no longer afford to ignore the orthodontic needs of child patients or to give only cursory attention to these needs. An increasing number of mothers are bringing their children to orthodontists for consultation on the advice of family physicians and pediatricians, without so much as discussing the need with the dentist who may have had the child under constant observation for a number of years, but who never mentioned the child's

malocclusion, which finally aroused the concern of the mother herself.

Parents may well question the competency of the dentist who sees only the cavities in the teeth of their child without taking into account also the development of the occlusion of the teeth. In order to maintain a successful practice, dentists will of necessity have to become familiar with certain basic orthodontic principles as well as with definite procedures in the prevention, interception and correction of incipient malocclusion of the teeth of children. In short, the dentist will have to practice what may well be termed "prophylactic orthodontics."

What the dentist should know and what he should tell parents about the orthodontic needs of their children is not easy to define in view of the fact that orthodontics is in a constant state of flux and orthodontic opinion is undergoing rapid change, especially in the field of mechanics. However, such knowledge as we have should be made available and put to practical use. A great deal of incipient malocclusion which the general practitioner of dentistry has ignored in the past requires no orthodontic appliances or only the simplest mechanical aids. Preventive procedures in orthodontics—prophylactic orthodontics—do not involve procedural methods expected only of the specialist in orthodontics, but come well within the scope of the general practitioner of dentistry.

For the sake of brevity, we shall consider only some of the broader aspects of prophylactic orthodontics. The question one most frequently hears is: "At what age should a child receive orthodontic treatment?" This problem has in the past received much consideration from orthodontists and the consensus may now be said to be definite because of a general understanding of the relationship of development and growth to the orthodontic problem. Orthodontic treatment does not depend on the age of the patient, but rather on the presence of a condition which interferes with the continued normal development and function of the dentition of the child.

It is of utmost importance for dentists to know the average ages when eruption of the deciduous and permanent teeth takes place, when the deciduous teeth are to be shed and the pattern and sequence of eruption of individual teeth. Malocclusion, it should be recognized, may be induced by retention of deciduous teeth beyond the physiologic age when they should be shed, as well as by premature loss of such teeth.

The dentist should always remember, however, that "averages" do not apply with exactness to the individual child. In order to avail ourselves of averages as a diagnostic measure of normality, we should regard the pattern of tooth development in time and space. In other words, we must have a good conception of not only the ages at which deciduous teeth erupt and are shed and the sequence of permanent tooth eruption, but also the relative relationship of the teeth and dental arches to each other and to the cranium during the deciduous, mixed dentition and the permanent tooth eruption periods.

Generally speaking, we can say that a tooth distribution which is not usually seen in children of that particular age and stage of development may be regarded as a sign of abnormal dental development. Gross malocclusion in the young child is usually progressive. Early treatment of such malocclusion is conducive to better esthetic and functional results. By gross malocclusion, we mean a definite malgrowth or malrelationship of the dental arches; for example, a prognathic relationship of the lower jaw or, conversely, a decided lack of development.

In the young child, erupted teeth coming into occlusion, especially in the in-

cisor region, may appear to be, and they frequently are, in malocclusion. These cases should be followed up in order to determine definitely whether the child's teeth are actually in abnormal occlusion or the apparent abnormality is merely a phase of growth that will disappear as the dentition develops and the teeth finally come into full normal occlusion.

Positional anomalies of individual teeth in children with both deciduous and permanent teeth require a series of observations over a period of time before a diagnosis of malocclusion can be established. It should be remembered also that correction of malocclusion at an early age does not necessarily obviate treatment of malocclusion at a later age. Malocclusion during the early active growth period can be corrected to the normal for a given age only. During the later growth period, when more of the permanent teeth erupt, there may again be malocclusion.

Early or immediate treatment includes the elimination of habits interfering with normal dental development. Habits concerned with the dentofacial zone are frequently of psychosomatic origin; in other words, they may have mental and general physical entailments, and must be dealt with in consideration of such possibilities in order to be successfully eliminated.

It is true that many children who have sucked their thumbs never show malocclusion. Others have been reported to show correction of malocclusion when the habit was stopped. The fact remains that, as is true of almost everything pertaining to living beings, categoric statements cannot be made to fit every case. We can speak only of usual or average occurrences. Speaking then from the standpoint of averages, we would say that the child who persists in habitual thumb or finger sucking or lip and cheek sucking or biting, will very likely show the effects of this habit in the dentition.

Habits themselves are not the factors that determine the degree of malformation. This depends on the response of the child. A child in good general health, whose calcium and phosphorus intake is normal and whose vitamin, mineral and caloric intake is adequate, will not, as a result of the habit, show the aggravated conditions that are frequently seen in undernourished, endocrine-deficient children.

It is important for the dentist in general practice to realize that in every service rendered his patients, whether it be operative, prosthetic, periodontic or surgical, his ultimate aim is to maintain, preserve, promote or restore the occlusion of the teeth in order to achieve maximum functional and esthetic efficiency. The foregoing applies even more to child patients. In order to realize this aim, the dentist must carefully observe his child patients and apply simple procedures of a prophylactic nature in those cases where interception of malocclusion is indicated.

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MAY 1 *Editorial Department* 1944

HORACE WELLS CENTENARY CELEBRATION
HARTFORD, CONN., DECEMBER 11, 1944

ON December 11, 1944, the American Dental Association will fittingly celebrate the one hundredth anniversary of the discovery of anesthesia at Hartford, Conn. It was on December 11, 1844, just one hundred years ago, that Horace Wells, a dentist of Hartford, discovered the fact that inhalation of the gas known as nitrous oxide would so anesthetize the tissues of the body that complete insensibility to pain from surgical procedures was produced.

Almost from the discovery date noted, many efforts from numerous sources have been made to deprive Wells of the credit of this epochal discovery and at the same time to divert the honor to some other individual.

As a background for our steadfast contention that the honor of the discovery of the physical phenomenon of anesthesia belongs unreservedly and alone to Horace Wells, let us recite but briefly the incident which led to this discovery.

On the evening of December 10, 1844, while attending an entertain-

ment given by a traveling lecturer, Gardener Colton, at which exhibitions of humorous reactions to the effects of administration of nitrous oxide gas were witnessed, Wells saw the possibilities of the pain-killing effects of the gas. Another member of the audience, Mr. Samuel A. Cooley, a citizen of Hartford, was severely injured shortly after inhaling the gas, yet experienced no pain until the effects of the gas had disappeared.

Horace Wells

The next day, December 11, 1844, Dr. Wells procured a quantity of the gas from Colton, administered it to himself and, while under the influence of the gas, had one of his own teeth extracted by Dr. John M. Riggs, another Hartford dentist, and felt no pain whatsoever from the operation. The operation was performed in the presence of several friends of both Dr. Wells and Dr. Riggs, all of whom later confirmed the pertinent facts of the incident when Wells claimed the discovery of the anesthetic properties of nitrous oxide gas.

Wells' announcement of the discovery of the phenomenon of anesthesia was the signal for various other men to aspire to the honor, and

while it appeared at times that Wells would be deprived of the great distinction, the integrity of the witnesses and associates of Wells at the first administration has withstood all efforts to deprive him of it.

Wells made no claim to the discovery of the many peculiar properties of nitrous oxide gas, some of which had been known from the time of Sir Humphrey Davy. He did claim that he was the first to demonstrate and proclaim the fact that nitrous oxide gas when inhaled in sufficient quantities would permit certain surgical operations to be performed without pain to the subject. And we believe that time, argument and contentious discussion have indubitably established that fact.

While several isolated demonstrations of the anesthetic properties of nitrous oxide varied from success to actual failure, and while there is little doubt that the phenomenon of anesthesia had been produced previously, the fact remains that Wells proclaimed, promoted and perfected the production of anesthesia for the painless performance of surgical operations. In 1844, Dr. Wells, according to definitely authentic records, discovered the fact that insensibility to pain could be produced by the use of nitrous oxide gas, so-called laughing gas, and that during this stage of insensibility, a person would not be conscious of pain caused by a surgical operation.

The discovery was announced to the world, and the condition of insensibility to pain thus produced was named anesthesia by Dr. Oliver Wendell Holmes. Dr. Wells continued to administer nitrous oxide gas to produce insensibility to pain during extraction operations for some years.

Notwithstanding the clear cut evidence here recited, several other aspirants have disputed the claim of Wells, both in point of time and in the means of producing anesthesia. However, the Legislature of the State of Connecticut, in 1847, after a thorough investigation of the facts surrounding the discovery of anesthesia, memorialized Horace Wells in its records, and later sponsored the erection of a monument on the State House grounds dedicated to Dr. Horace Wells as the discoverer of anesthesia.

The General Assembly of Connecticut, in a special session held in January 1944, again reaffirmed by resolution its belief and conviction that this great honor is deserved by Horace Wells:

Special Session of General Assembly of Connecticut,
January A. D., 1944.

RESOLUTION COMMEMORATING THE 100TH ANNIVERSARY OF THE DISCOVERY OF ANESTHESIA BY DR. HORACE WELLS

Resolved by this Assembly:

WHEREAS for centuries a way to make the human body safely in-

sensible to pain during surgical operations and related conditions of suffering had been a hopeful dream; and

WHEREAS that dream came true when in Hartford, Connecticut, on December 11, 1844, Dr. Horace Wells, a member of the dental profession, having concluded that nitrous oxide gas breathed into the lungs would induce general harmless insensibility to pain, voluntarily tested this belief by inhaling in the presence of colleagues enough of that gas to cause temporary unconsciousness, whereupon by previous agreement Dr. Riggs by accustomed method extracted a molar tooth from the mouth of Dr. Wells, who throughout the operation felt none of the usual sensations of pain, recovering completely from the effects of the anesthetic soon after the tooth had been removed; and

WHEREAS, in the spirit of exalted public service, Dr. Wells promptly thereafter gave to patients in his private practice the benefits of his method of inducing general anesthesia and also made freely and widely known this simple yet extraordinary means of pain prevention, thereby favoring universal extension of its beneficence and also facilitating improvement of its technique by numerous further tests, thus becoming one of the world's greatest benefactors; and

WHEREAS the centenary of the first steps in the development of present-day methods of anesthesia—by the man who not only had the distinction to conceive a successful fundamental procedure, but also the courage and unselfishness first to subject himself to all of its possible dangers—will soon be celebrated to express the abiding gratitude of mankind for the priceless blessing that Dr. Wells' endeavors initiated; now therefore be it

Resolved that it would be appropriate for the Governor to designate December 11, 1944, as Horace Wells Anesthesia Day; and be it further

Resolved that, in harmony with the public purpose of the said centennial celebration, there be repeated in the record of this Assembly the resolutions on Dr. Wells' historic discovery that were adopted by our predecessors in this Assembly in 1847 and 1853, to wit:

1847, May—"WHEREAS, it being understood by this Assembly that Doctor Horace Wells, of Hartford, discovered, in 1844, that nitrous oxide gas, or the vapor of ether, inhaled by persons, causes insensibility to pain, in amputation or other surgical operations, which discovery has been most honorably noticed by various medical societies in London, and by the Academy of Medicine, and by the Parisian Medical Society in France, and has since been in use in England, France and in this country; therefore

"*Resolved* by this Assembly: That the aforesaid discovery by Dr. Wells, of Hartford, Connecticut, of the use of *nitrous oxide gas,* or *vapor of ether* in surgical operations, is of great importance to the public, and entitles the inventor to the favorable consideration of his fellow citizens, and to the high station of a public benefactor."

1853, June—"*Resolved* that the resolution adopted in 1847, attributing to Dr. Horace Wells the discovery of the principle of anesthesia by inhalation of gases or vapors, is justified by subsequent developments."

Resolved Further that this Assembly hereby reaffirms the foregoing

resolutions not only as currently significant in general, but also as indicative of early understanding and appreciation throughout the State of Connecticut of the boon of practical general anesthesia that Dr. Wells gave to humanity.

State of Connecticut
Senate
PASSED

State of Connecticut
House of Representatives
PASSED
JAN. 28, 1944

The occasion of the Wells Centenary will furnish another opportunity for Dentistry to again affirm its conviction and belief that the honor of this humanitarian discovery belongs to our own Horace Wells.

The difficulties of transportation incident to the war make it inadvisable to hold a large central celebration meeting. It is therefore planned to have the main centennial celebration in Hartford, Conn., on December 11, 1944.

Horace Wells Centenary State Committees have been appointed for each state and all state societies have been requested to dedicate their 1944 annual meetings to Horace Wells and the discovery of anesthesia.

Dr. Arthur H. Merritt, New York City, has been appointed chairman of the Committee on Essayists and Speakers at the Hartford Meeting.

Dr. William J. Gies, New York City, has been chosen to prepare and edit the Historic Volume on the Wells Centenary Celebration.

Dr. Walter T. McFall, Asheville, N. C., has been chosen as Chairman of Publicity.

The Horace Wells Centenary Committee of the American Dental Association asks for your support and urges you to cooperate with your state and local committees in bringing the plans for this momentous occasion to a successful conclusion on December 11, 1944.

The national committee, known as the Horace Wells Centenary Committee—1944, is as follows:

L. Pierce Anthony, Chicago
W. Harry Archer, Pittsburgh
Don J. Aubertine, San Francisco
B. Lucien Brun, Baltimore
Eugene M. Clifford, Hartford, Chairman
W. J. Gies, New York
W. N. Hodgkin, Warrenton, Va.
Paul H. Jeserich, Ann Arbor
W. E. Mendel, Pittsburgh
Arthur H. Merritt, New York
Frederic T. Murlless, Jr., Hartford, Secretary-Treasurer
Oren A. Oliver, Nashville
Howard R. Raper, Albuquerque, N. M.
Robert L. Sprau, Louisville
T. I. Way, Cincinnati
Walter T. McFall, Asheville, N. C., *Chairman,* Publicity Committee.

AMERICAN ASSOCIATION OF DENTAL SCHOOLS TWENTY-FIRST ANNUAL MEETING

THE twenty-first annual meeting of the American Association of Dental Schools convened in the Drake Hotel, Chicago, March 20-22, with full representation from the thirty-nine member institutions.

Charged with the responsibility of the educational preparation of those entering on the study of dentistry, and at a critical period in the relations of the profession to the Government and the public, this organization has an important influence on the extent and character of preparation for dental practice of the future. The Government, in its endeavors to meet the demands of the fighting forces of the Army and the Navy, has inaugurated in the dental schools an accelerated curriculum intended to provide for dental health service to an extent and degree not anticipated in the years approaching the present war.

The Association of Dental Schools, in the early days of the adoption of this accelerated program for producing more and better dentists, was given scant consideration as to its capabilities to adopt or adjust itself to a schedule that would discard all precedents in dental education, but has accepted the responsibility, if with some trepidation, and has conformed its educational programs to the new idea with surprisingly little disturbance of orthodox dental educational procedures.

In the nature of the case, it was to be expected that the program at the recent meeting would revolve around the efforts of the schools to meet the dental needs of the armed forces; and that was the theme of the meeting.

The general sessions were devoted to discussion of what may be considered the major problems created by the war emergency. The section meetings were devoted to discussion of the technical phases of the various branches of dentistry.

Round Table Conferences, a comparatively new feature of the meetings, were held on Tuesday afternoon. These conferences, where teachers of related subjects meet to discuss the various phases and problems of teaching their particular subjects, have become very popular with faculty men.

For example, in the prosthetic section, much attention was devoted to discussion of the problems of prosthetic technic, which led naturally to a discussion of the laboratory technician and his future relation to the profession, and some interesting and serious phases of the technician's

relation to the profession were brought out. While no definite conclusions were reached, it was the consensus of opinion that this was a serious problem and that the demands of the war emergency had added much to its seriousness in that the large number of young men who are being trained as laboratory technicians will probably have to be provided for after the war.

One of the results of the discussion of the scope of the laboratory technician was a resolution adopted by the association vigorously protesting the assumption that dental prosthetic work can be relegated to persons untrained in the biologic and physical sciences; and further resolving "that this section (the section on prosthetic dentistry) place itself on record in the *Transactions of the American Association of Dental Schools* as condemning this concept as detrimental to the health and welfare of the public and to the dental profession."

The main topic of discussion of the meetings was the program of the Army and Navy for supplying students for the schools and providing for their predental preparation. Much perturbance has resulted from the more or less vacillating policy of the government on this vital subject, but the schools have been able to adapt themselves to the changing conditions in a remarkably facile manner. The question of greatest concern here, however, seems to be failure to consider the continuation of student supply when the present provisions are met, or after July 1, 1944.

Another question which attracted consideration was the desirability of provisions of postgraduate courses by the various schools for dentists returning from Army service, and while the schools are at present greatly overworked in meeting the accelerated program, they are earnestly planning for more postgraduate work, a feature of follow-up dental education that has been neglected in the past.

An exceedingly interesting highlight of the meeting was the session devoted to the report of the Council on Education on the survey of the schools just made by the Council. The secretary of the Council, Dr. Horner, outlined the mode of procedure for examining the schools and the gathering of data upon which the schools are to be classified.

At the Tuesday morning general session, a discussion of socio-economic problems of dentistry considered the general trends toward increasing social security as a result of war, and a plan was projected for participation in a national program by the teachers' association.

At the closing session, the following officers were elected for 1945: A. W. Bryan, Iowa, president; W. C. Fleming, California, president-

elect; Arnold D. Mason, Toronto, vice-president, and Carl O. Flagstad, Minnesota, secretary-treasurer. Kansas City, Mo., was chosen as the place of meeting for the 1945 session, March 19-21.

DEATH OF DR. C. VICTOR VIGNES

It is with much sadness that we announce the death of Dr. C. Victor Vignes, of New Orleans, La., which occurred on April 1, 1944.

An obituary notice of Dr. Vignes will appear in a later issue of THE JOURNAL.

DEATH OF DR. STANLEY CLARK

We regretfully announce the death of Dr. Stanley Clark, of Chicago, which occurred on April 1, 1944.

An obituary notice of Dr. Clark will appear in a later issue of THE JOURNAL.

BIBLIOGRAPHICAL

Planning and Treatment for Bite Raising. By HARRY KAZIS, D.M.D., Boston, Mass. 538 pages, 702 illustrations. Price $10. Brooklyn: Dental Items of Interest Publishing Company, Inc., 1943.

THREE reviews of planning and treatment for bite raising by Harry Kazis (J.A.D.A., 31:104, January 1, 1944; *Illinois D. J.*, 13:84, February 1944; *Fortnightly Rev.*, 7:16, February 1944) have come to the reviewer's attention. None of these has pointed out serious errors in the second chapter, entitled "Mechanics of Mastication." It is difficult to understand how these errors could have occurred if, as claimed, this chapter was written in collaboration with an engineer, since some of the basic principles of analytic mechanics are violated, with entirely incorrect conclusions. On pages 22 and 23, with the aid of Figures 23 and 24, the vertical forces exerted by the muscles of mastication and the resulting vertical forces at the occlusal surfaces are considered in a vertical plane at right angles to the saggital plane in the region of the molar teeth. An attempt is made to show that when tough food is chewed, the action is different from the action when little resistance is met. It is claimed that, in the former case, "any part of the morsel while offering resistance to one biting force may at the same time act as the pivot point with respect to another." After a consideration of the lengths of the lever arms involved, the statement is made that it can be "seen how great a crushing force—many times the muscle force applied . . . can be produced at the tooth cusps." This statement is entirely erroneous. An examination of Figure 23 and 24 shows an impossible situation. The cross-section of the mandible in the plane considered is represented as a lever of a non-existent type. All the forces are shown in one direction, with the "pivot" at the end of the lever away from them. The "pivot" is not represented as exerting any force. Also, the muscle pull to the side of the "pivot" opposite the forces is ignored, though it is this

muscle that exerts nearly the total applied force and its pull that would put the system in equilibrium if the forces exerted by the so-called "pivot" and the worked on portion of the food morsel were shown correctly.

The problem is one of the static equilibrium of a rigid body which has, for the sake of simplicity, been reduced to a consideration of the forces as coplanar (in one plane). One of the conditions for the static equilibrium of a rigid body subjected to coplanar forces is that if the components of force along the coordinate axis are added algebraically, they equal zero. Since the only forces considered are vertical, this means that the sum of the upward forces should equal the sum of the downward ones. This condition has not been met in the diagrams. The other condition of equilibrium is that the algebraic sum of the moments of the applied forces (force times the perpendicular distance from the line of action of the force to the axis of rotation) about an axis through any point of the body perpendicular to the plane of the forces is equal to zero. In this particular case, this means that if any point in the bar (or lever) representing the mandible is arbitrarily selected, the sum of the quantities obtained by multiplying each force tending to produce clockwise rotation about an axis through the arbitrary point, by the distance from it to the point of application of the force, must equal the sum of the same quantities for the forces tending to rotate the bar counterclockwise. This condition also has not been met in the diagrams.

The problem may be greatly simplified by considering the bar as being supported at its ends by the upward pull of the muscles of mastication. The resistance of the food would then act downward at the points where it contacts the teeth. It is obvious that any change in the resisting forces or their points of application would mean merely a redistribution of the load between the muscles at the ends of the bar. In this case, of course, the distances between the points of application of the resistance cannot change.

It should now be clear that no increase in the total force applied to the food can be gained, but only a change in its distribution between the muscles of mastication. The same type of error is made again on page 26 and in Figure 28. Here, however, the result is more incongruous for, according to this reasoning, a greater force could be exerted in the anterior part of the mouth than in the posterior, which is not only contrary to experience, but also to mechanical theory. It is obvious that, with a constant muscle tension, the movement of the applied force is constant. Since the opposing movement produced by the resistance of the bolus is equal to it, the force of resistance and hence the force applied to the bolus must decrease with the increase in length of the lever-arm as the bolus is moved anteriorly.

The same type of error is carried through the remainder of the chapter, but the results are not quite so incongruous. The statement is made on page 27 that "with the presence of a bolus of food, pivoting of the mandible takes place at the mesial end of the bolus, that is, the mandible pivots wherever the food is located." The condition under consideration is one of static equilibrium which precludes movement. Under this condition, any point in the mandible may be considered as locating an axis of rotation perpendicular to the plane of the forces (one side of the mandible is taken and the forces considered coplanar), as pointed out previously. When, however, the food actually yields or while it is yielding, the condition is no longer one of static equilibrium. Since the bone of the skull resisting the condyle does not yield, the mandible rotates about an axis through their point of contact and perpendicularly to the plane of the forces.

ARTHUR B. GABEL.

ASSOCIATION ACTIVITIES

Contents

FIFTH WAR LOAN 680

WAR SERVICE COMMITTEE 680

BUREAU OF PUBLIC RELATIONS

Postwar Dental Programs for Official Health Agencies. George A. Nevitt, B.S., D.D.S., M.S.P.H. 683

Patient Load of Dentists in 1943 686

Institute on Dental Health Economics 688

Second "War Conference" on Industrial Medicine, Hygiene and Nursing 689

COUNCIL ON DENTAL THERAPEUTICS

Report of the Fifteenth Annual Meeting of the Council on Dental Therapeutics 690

Kolynos Dental Cream—Deleted from A.D.R. 692

Accepted Dental Remedies 694

COUNCIL ON DENTAL HEALTH

New Executive Secretary for Council on Dental Health 695

COMMITTEE ON LEGISLATION

Medicodental Relations in the Armed Services 696

RESEARCH COMMISSION

Mid-Year Report of the Research Commission 698

CORRESPONDENCE

Dental Practice and Dental Education in the Future 700

DEATHS 702

FIFTH WAR LOAN

THE Treasury Department will soon announce the Fifth War Loan Drive and appeals to all members of the dental profession to respond even more generously than they did for the Fourth War Loan.

The Loan Drive will probably start on Flag Day, June 14, and end on Independence Day, July 4. These days are significant in American History and should inspire each of us to buy another bond as an investment, and as another evidence of our continued support for Victory.

I hope that all component societies will put their efforts behind the Fifth War Loan Drive, with the same enthusiasm that characterized the dental profession in the Fourth Loan. Let us purchase more bonds—especially between June 14 and July 4.

C. RAYMOND WELLS,
President.

WAR SERVICE COMMITTEE

AMERICAN DENTAL ASSOCIATION
CHICAGO, ILL.

February 24, 1944

Office of the President
4701 Connecticut Ave.
Washington 8, D. C.

The Honorable
The Secretary of War

My dear Mr. Secretary:

The War Department Order Suspending the Army Specialized Training Program of Undergraduate Education involves quotas of students destined for enrollment in dental schools in the 1944 and early 1945 classes.

Should the order as issued become effective, predental students will be denied further study, and as a consequence dental schools will not have sufficient enrollment to provide the minimum requirement of dentists to enter the practice of dentistry.

Selective Service would only provide that the total number of preprofessional students occupationally deferred at any one time does not exceed 50 per cent of the total average number of students in schools of dentistry, and that the total number of students occupationally deferred at any one time, who have been accepted for admission by such school, does not exceed that part of the capacity of such school available for civilian students in the entering classes for which such students have been accepted.

In addition to private practitioners, dental manpower must be furnished to the following:

1. U. S. Public Health Service
2. U. S. Veterans Administration
3. Indian Service, Department of Interior
4. Farms Security Administration, Department of Agriculture
5. Faculties of dental schools
6. Essential public clinics for children, notably:
   Guggenheim Dental Clinic, New York City
   Eastman Dental Dispensary, Rochester, N. Y.
   Forsyth Dental Infirmary, Boston, Mass.
7. Public school systems in many cities of the United States
8. Associations for improving the conditions of the poor
9. Dental staffs of municipal hospitals throughout the United States Industry

Early in the war, the dental schools of the United States accelerated their teaching programs and adjusted their procedures to the needs of the armed forces and the war effort in general. The cancellation of agreements by the Army at this time would terminate

enrollments and prove fatal to the essential dental educational program in the United States, so necessary to public health. Therefore, such an eventuality would not be in the interest of the health, welfare and safety of this country either in time of war or in time of peace.

In entering into the agreement with the War Department and the subsequent placing of dental students in uniform, it was made almost impossible for dental schools to secure civilian dental students because of the embarrassment to young men at not being in uniform. If the Nation is now left with the false idea that the War Department thinks that no more dentists are needed, naturally patriotism is going to prevent many young men from considering dentistry as a vocation.

The American Dental Association plea is based upon the need for dentists to enter the profession to maintain a minimum level of safety.

The Board of Trustees and the Council on Dental Education of the American Dental Association urge a reconsideration of the order and a revision that will restore the provision for the training of that number of predental students previously declared by the Surgeon General's office.

Please be assured that the dental profession is most grateful for your serious consideration of this important public health problem, to which the Army Specialized Training Program is so closely allied.

Respectfully yours,

(s) C. RAYMOND WELLS, *President.*

March 9, 1944.

Dr. C. Raymond Wells,
President, American Dental Association,
Apartment 509,
4701 Connecticut Avenue,
Washington 8, D. C.

Dear Doctor Wells:

Your letter of February 24, 1944, addressed to the Secretary of War, regarding dental training under the Army Specialized Training Program, has been referred to this office for consideration and reply.

It is not the intention of the War Department to curtail the preprofessional and professional training offered in medicine, dentistry and veterinary medicine. I am inclosing a copy of a press release which gives complete information about this training that is being offered.

Very truly yours,

J. A. ULIO,
Major General,
The Adjutant General.

April 4, 1944.

To the Dental Profession:

Conferences with officials of the War Production Board have developed certain angles in the matter of dental equipment and supplies, which have been very well summed up in a statement carried in the current issue of *The Dental Trade,* as follows:

"Dental supply dealers are permitted to purchase and sell any dental item without benefit of preference rating. The only dental items which may not be sold without permission—as distinguished from preference rating—are the pressure sterilizer or instrument sterilizer larger in size than 16 inches by 6 inches by 4 inches.

"Of course, not every article used in the practice of dentistry before the war is available today. However, much of the customary merchandise and equipment which could not be obtained several months ago is available now. It is believed many more of these will reappear on the market in the immediate future.

"It may be necessary for the dealer to secure a preference rating in order to obtain delivery from a manufacturer who is not strictly a dental manufacturer. Examples of this type of purchase are bulbs for dental operating lights, and some makes of dental lathes.

"Preference rating on a quantity of bulbs for operating lights, for stock, may be obtained by the dealer, by making application to the War Production Board on Form WPB-547 (formerly PD-IX). The form may be obtained from local War Production Board offices or from the American Dental Trade Association. In preparing the application, the dental dealer should state that the bulbs are for 'resale to dentists for use in dental operating lights.'

"Those dealers who have secured preference ratings on bulbs have stated they experienced little difficulty in obtaining deliveries.

"Similar appropriate information should

be given when the dealer makes application for preference rating on dental lathes.

"The purchase of paper products, chiefly paper cups and packaging materials, is a major problem. The War Production Board does not issue preference ratings on these items, and it is necessary for the dental dealer to place his orders with his supplier well in advance of the required delivery date. Conservation of all paper products is urged, and is essential.

"Many changes have been necessary in the past several years, and many more changes will be required in the future. If the dental dealer makes every possible effort to adapt himself to adjustments which are necessary, little actual hardship will be experienced, either by the industry or by the profession."

It goes without saying that the profession, as these matters are brought to its attention, will as usual adapt itself to any adjustments, or even hardships which may be necessary in the interests of the war effort.

C. WILLARD CAMALIER, *Chairman.*

WAR SERVICE COMMITTEE
AMERICAN DENTAL ASSOCIATION
Rm. 311, 1726 I St., N.W.
Washington 6, D. C.
April 7, 1944

No. 66

To:
Chairmen, State Military Affairs Committees
Secretaries of State Dental Societies
Editors of Dental Journals
Officers and Board of Trustees
War Service Committee

The increasing demand for manpower by the armed forces includes the need for dental technicians. The War Service Committee has been informed that the Army and the Navy require more dental technicians, in order that the immense rehabilitation program of the armed forces may go forward. There is a great need for the replacement of missing teeth with artificial substitutes. The Navy, for instance, has just embarked upon an expansive dental prosthetic program and requires many young and skilled senior and junior dental technicians to assist the dental officers of the Naval Service to process prosthetic appliances. With the recent order of Selective Service to reclassify all men, particularly those from 18 to 26 years of age, it appears practically impossible to retain in civilian dental laboratories dental technicians 18 to 26 years of age. Therefore, dental laboratories should be prepared to replace technicians in this age group in order to furnish the armed forces with young men. The War Service Committee has consistently maintained that dental laboratories should anticipate the loss of young dental technicians, and that it was unlikely that Selective Service could continue to give consideration to their deferment, within the essential category. The Dental Laboratory Institute of America, with the support of the War Service Committee of the American Dental Association, has filed a request with the Essential Activities Committee, War Manpower Commission, for senior dental technicians 30 years of age and over to be placed on the critical list, on the grounds that this age group should not be disturbed if the dental laboratories are to maintain any semblance of service. No decision on this matter has been rendered to date. In this age group are highly skilled key men capable of training replacements for the younger dental technicians. Because the dental laboratory group is young, many senior dental technicians are under 30 years of age, and therefore the armed forces should be able to secure manpower from this young age group. The loss of additional dental technicians, especially over 30 years of age, will seriously interfere with civilian dental practice in slowing down the technical phases demanded by members of the profession. However, the dental laboratories and technicians must feel very proud of the fact that they are contributing so many of their craftsmen to the armed forces and their technical aid to the civilian dentists.

Like dental students, dental technicians in the age groups needed by the armed forces will be classified in class 1A and be forwarded for a preinduction physical examination for the purpose of determining their physical qualifications for the armed forces. If the dental laboratory desires to file an appeal, it should do so as soon as the technician has been placed in class 1A. The appeal will not be decided until after the preinduction physical examination, and a period of twenty-one days will ensue before the registrant can be sworn into the armed forces. If the appeal is denied, the dental laboratory, with the aid of the State Dental

Military Affairs Committee, should consult with the State Director of Selective Service in order to assist in retaining skilled dental technicians in the age group mentioned. In some instances, it may be necessary for the dental laboratory to request a presidential appeal. This may be done if the Appeal Board vote is divided. In the event there is no division of vote, the dental laboratory should request the state director for assistance and guidance. It is requested that the dental laboratories handle these cases with the aid of the State Dental Military Affairs Committees, in their own locality and in their own state. The War Service Committee of the American Dental Association stands ready and willing to assist the dental laboratory in presenting facts to Selective Service when there appears an injustice has been done.

C. WILLARD CAMALIER, *Chairman.*

BUREAU OF PUBLIC RELATIONS

POSTWAR DENTAL PROGRAMS FOR OFFICIAL HEALTH AGENCIES

GEORGE A. NEVITT,* B.S., D.D.S., M.S.P.H., Bethesda, Md.

IN discussing postwar dental programs for official health agencies, it would be unwise to attempt to predict what the future will bring in the way of a specific dental program. There are, however, certain basic principles involved in making dental service available to all the people. Therefore, it would seem logical that a picture of postwar dental programs be sketched now, leaving space for more color and detail to be added, as the program develops.

The principle that "the health of the individual is the concern not only of the individual himself but of society as a whole" seems destined to become the keynote of future public health programs. This principle is based on the fact that the health of a community as a whole depends on the health of the individuals who compose the community.

The people of the nation, realizing that a literate population was necessary for a well-functioning democracy, about 100 years ago set up through the state and local governments a school system, which was quite crude in the beginning, but later developed into an effective and well-functioning organization in most areas. In a similar way, the nation will make provision for its people, especially children, to obtain medical and dental health by the same method that education is provided in the public school, without consideration as to the ability of the family to pay for such services.

Public health dental programs may well be compared to the school system of 100 years ago, since they are now in the formative stage. None of us can at present say with certainty what pattern these programs should or will take. Detailed plans should not be made now for a future dental program.

That the profession of dentistry is thinking of postwar dental programs

*Passed Assistant Dental Surgeon (R), U. S. Public Health Service.

*Read before the Health Officers' Section of the Seventy-Second Annual Meeting of the American Public Health Association, October 13, 1943.

From States Relations Division, U. S. Public Health Service, District No. 1.

might be well illustrated by excerpts from a message on postwar dentistry delivered by Oren A. Oliver, president of the American Dental Association, in August 1942:

> The pressure of new knowledge and the desire for increased national health will alter considerably the philosophy of dentistry as well as its content. . . . Dentistry cannot be isolated from the problems of unemployment, farm production, old age security, education and the like, for every change in our social and economic structure will affect the dental profession as well as the consumers of dental services. It is therefore essential that the dental profession begin as soon as possible to build a postwar platform. . . . Postwar planning in dentistry is absolutely imperative, and the organized dental profession might do well to establish a postwar planning board of some kind, at the same time making possible the utilization of the services of experts in the various social and economic fields which touch the problems of the dental profession.[1]

There are three objectives that must be constantly kept in mind in the development of a dental program: 1. That every individual, regardless of his residence or economic status, shall be given an opportunity to receive adequate dental care. 2. That the dental profession shall not suffer either scientifically or economically. 3. That the ultimate goal of any dental program shall be correction. In the absence of specific preventive measures, the third principle is based on the fact that the science of dentistry now has available knowledge regarding the control of dental disease by operative procedures. However, at the present time, it is estimated that only about 25 per cent of the population in this country can enjoy these benefits. The result of this fact is clearly shown by the large proportion of rejected selectees, as indicated by the records of the Medical Division of the Selective Service System, Washington, D. C.[2] This situation also focuses attention upon the need for learning to control or prevent dental caries.

Although the studies of fluorides now being carried on by the National Institute of Health of the U. S. Public Health Service may eventually pave the way for a simple procedure of controlling, to some extent, dental caries of the population by the addition of a definite amount of sodium fluoride to the community water supply, it is too early to speculate on this method or build our hopes too high. The presence of fluorine in a community water supply, however, has been definitely shown to be associated with a low caries rate; but it must be remembered that the physiologic mechanism involved is not yet understood.

There also seems to be considerable evidence that reduction of sugar and starch in the diet is accompanied by a reduction of caries. In spite of these two observations, which may assist in controlling caries, the only practical method in use today is the operative procedure of removing the diseased tooth structure and restoring the normal tooth contours by means of a filling. The immediate postwar dental programs, therefore, must be formulated on the basis of a corrective dental program.

The task of providing dental care to the 90,000,000 persons, or 75 per cent of the population who are not receiving dental care, is staggering. This task must be undertaken piecemeal by groups since the professional manpower to do the work is insufficient at the present time, even if the funds for such a project were unlimited. The principle of administering group medical service seems to be well founded.

The U. S. Public Health Service was one of the first official agencies in this country to give medical care to a group; namely, the merchant seamen.

An act of Congress, approved July 16, 1798, authorized the President to nominate and appoint medical officers to furnish medical treatment and hospital care to sick and disabled seamen at such ports and other places in the United States as presented needs for services of

this nature. A tax of 20 cents per month was collected by the Collector of Customs, under the Treasury Department, from all seamen employed on American vessels engaged in foreign and coastwise trade. This method of financing hospital service was prescribed by the early legislators and was the origin of the U. S. Public Health Service.

Under Title VI of the Social Security Act, approved in 1935, an appropriation was made to the Public Health Service of $8,000,000 annually (since increased to $11,000,000) for distribution to the states for the purpose of strengthening and extending state and local health services. The amount of this Title VI money expended on dental programs within the states has been dependent on the specific need and the degree of importance attached to the dental problem by the state health officer. However, it may be safely stated that money so expended has been definitely limited to dental programs for a restricted group; namely, dental health education and, in some cases, specified dental service to indigent children.

The U. S. Children's Bureau, operating under Title V of the Social Security Act, is also concerned with extending service to a group; namely, mothers and children, especially in rural areas. Congress recently appropriated additional funds to the Children's Bureau to provide free obstetrical care to the wives and medical care to the infants of enlisted men in the armed forces. The Farm Security Administration has developed a health program for low income farmers. The Veteran's Administration has a physical rehabilitation program for disabled discharged members of the armed services. The group basis for medical care appears to be sound. The group plan for postwar dental programs seems to furnish a method of approach that is worthy of trial.

The foregoing are all examples of federal participation in health programs. The official health agencies are now confronted with the problem of trying to determine for which age group a dental program would be most successful. With limited personnel and funds, it would seem that dental programs must be considered for four broad groups or combinations of groups. They are: (1) dentistry for all children; (2) dentistry for all indigents of all age groups; (3) dentistry for all children; emergency care for adults; (4) dentistry for all children; accumulated defects of adults to be corrected over a ten-year period.

It will be noted that, in all the four groups, emphasis is placed on the youngest groups. The child group is the choice of the Public Health Service as stated by Surgeon General Parran. I quote from Dr. Parran:

> Assuming that we cannot multiply by several times the number of dentists overnight, nor can we secure overnight tremendously increased expenditures on the part of the general population for dental care . . . we can do the best job under present knowledge of preventive dentistry by taking care of the annual crop of new dental defects which appear in grade school children.[3]

In any discussion of expansion of plans for health, the problem of financing is usually the subject that dominates. This too is true in the planning of postwar dental programs, but the problem of personnel and administration is of equal or greater importance.

The funds from federal sources for subsidizing a dental program or any health program will probably be based upon and distributed by a formula similar to the one now in use by the Public Health Service in the distribution of Title VI funds to state health departments. This formula is based on (1) population, (2) the special health problems and (3) financial needs.

This means that, in some areas, the Federal Government would be expected to meet practically the entire cost of

the dental program. In some cases, this might involve setting up the machinery and the incentive for voluntary location or relocation of dentists in the area. In other states, counties and cities, the dental program budget would include funds from federal, state and local sources, each bearing its equitable share of the cost. In some cases, there would be need of funds from outside sources for administrative expenses only. Some communities could and would be willing to assume full responsibility for the dental care of all their people.

SUMMARY

It is interesting to note that, as early as 1798, the Federal Government took cognizance of the medical needs of a special group of citizens (merchant seamen).

The examinations by Selective Service have focused the attention of the nation on the importance of dental health as related to the general health of the population. This is, therefore, an opportune time to develop a postwar dental program that will safeguard the interests of the dental profession, but will in no way hamper the maximum amount of dental service to all the people.

The beginning of a program, as suggested in this paper, could be made in one of the following four groups: (1) dentistry for all children; (2) dentistry for all indigents of all age groups; (3) dentistry for all children; emergency care for adults; (4) dentistry for all children; accumulated defects of adults to be corrected over a ten-year period.

This will include health education work as well as a corrective program. In the meantime, intensive efforts should be undertaken in the field of dental research to determine effective preventive measures, particularly for dental caries. The results of this research may modify the plans in operation or make it necessary to develop new plans for dental programs of the future.

BIBLIOGRAPHY

1. OLIVER, O. A.: Postwar Planning. J.A.D.A., 29:1506-1507, August 1, 1942.

2. Medical Statistics Bull. No. 1. Selective Service System, Washington, D. C., November 10, 1941.

3. PARRAN, THOMAS: Dentistry as Health Service. *Proc. D. Centenary Celebration*, 1940, pp. 56-61.

PATIENT LOAD OF DENTISTS IN 1943

How many different patients per week did the average white male dentist see in 1943?

The exhibit shown in the accompanying illustration graphically answers that question.

Dentists under 45 years of age working with one chair and no assistant saw 47.6 patients per week. Dentists under 45 years of age with one chair and one assistant saw 61.8 patients per week. Dentists under 45 years of age with two chairs and one assistant saw 72.9 patients per week.

As the dentist's age increased, the average number of patients seen each week decreased. Thus, dentists between the ages of 55 and 64 working with one chair and no assistant saw, on the average, 26.6 patients per week. Dentists in the same age group working with one chair and an assistant saw 44.0 patients per week. Dentists in the 55 to 64 age group working with two chairs and an assistant saw 55.5 patients per week.

This exhibit, prepared by Henry Klein, Charles Felnagel and Mrs. Ruth Shine, of the United States Public Health Serv-

ice, is based upon information given by a representative geographic sample of nearly 1,500 dentists canvassed through the cooperation of the Committee on Economics of the American Dental Association; the Procurement and Assignment Service; the War Manpower Commission and the Division of Public Health Methods, and the United States Public Health Service. It is 30 inches high, 24 inches wide and 13 inches deep.

United States Public Health Service exhibit showing number of patients per week seen by average white male dentist in 1943.

INSTITUTE ON DENTAL HEALTH ECONOMICS
UNIVERSITY OF MICHIGAN

THE School of Public Health of the University of Michigan announces plans for an institute on dental health economics, to be held at Ann Arbor throughout the week of June 26 to July 1.

It is the purpose of this institute to bring together a group of leaders in the field of dental health, under the chairmanship of Kenneth A. Easlick, associate professor of public health dentistry, in order that they may share their experiences and pool their thoughts on the improvement of the dental health of the American people.

It is the plan of the institute to review briefly the social and economic background of health problems and, against this setting, to develop a comprehensive understanding of the dental problem. Minimum standards of dental health service will be considered and concise information will be presented to assist in the development of a program to solve the dental problem at this level of standards.

It is intended that the work of the institute shall culminate, therefore, in concrete proposals for a dental health program designed to meet the challenging needs that are known to exist.

As an indication of the broad scope of the institute, the following are among the speakers who will participate in the formal program:

R. C. Williams, M.D., director, Division of Medical Services, United States Public Health Service

John W. Knutson, dental surgeon, United States Public Health Service

Henry Klein, senior dental officer, United States Public Health Service

Nathan Sinai, Dr.P.H., professor of public health, University of Michigan

Harold Y. McClusky, Ph.D., professor of educational psychology, University of Michigan

Melvin L. Dollar, Public Health Economics, University of Michigan

Marcus L. Ward, D.D.S., Jonathan Taft professor of dentistry, University of Michigan

Don W. Gullett, D.D.S., secretary, Canadian Dental Association

Harold Hillenbrand, D.D.S., Assistant Editor, JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

John Oppie McCall, D.D.S., director, Guggenheim Dental Clinic

John T. O'Rourke, D.D.S., dean, School of Dentistry, University of Louisville

Walter H. Phillips, D.D.S., director, Dental Division, Detroit Department of Public Welfare

R. M. Walls, D.D.S., member of Committee on Economics, American Dental Association

Jack M. Wisan, D.D.S., director, Dental Health Division, New Jersey State Department of Health

This institute will be of particular interest to officers and committee members of the American Dental Association and component societies, to representatives of both governmental and non-governmental agencies that are participating in dental programs, to the faculties of dental schools and to many private practitioners. Because of the nature and purpose of the institute, registration must be limited to fifty members. Although an attempt will be made to obtain a geographic distribution of the applicants, primary consideration will be given to the order in which applications are received. The registration fee will be $10. Requests for application blanks should be sent promptly to Kenneth A. Easlick, School of Public Health, Ann Arbor, Mich.

HENRY F. VAUGHAN, *Dean*,
School of Public Health,
University of Michigan.

SECOND "WAR CONFERENCE" ON INDUSTRIAL MEDICINE, HYGIENE AND NURSING

ST. LOUIS—MAY 9-14, 1944

THE second "War Conference" of industrial physicians, industrial hygienists and industrial nurses will be held in St. Louis, Mo., May 9 to 14, 1944, at the Hotel Jefferson. The participating organizations are (1) the American Association of Industrial Physicians and Surgeons, (2) American Industrial Hygiene Association, (3) National Conference of Governmental Industrial Hygienists and (4) American Association of Industrial Nurses.

The medical subjects to be presented include better health in small plants, the industrial physician's opportunity to advance medical knowledge, maladjustment and job environment, women in industry and a panel discussion on "Who Can Work?"

The industrial hygienists will examine the health hazards presented by the new synthetic rubber industry, radium, solvents, the toxicology of TNT, the possibilities of an excessive silica dust hazard in quartz crystal industry, lead fumes and hazards of exposure to cadmium.

The industrial nurses will consider postwar planning for nurses and medical services in industry and the rôle of the nurse in wartime industrial health work.

A paper on "Oral Manifestations in Occupational Diseases" will be presented by Bernard G. Sarnat, Friday morning, May 12. Through the courtesy of the Industrial Dental Committee, Council on Dental Health of the American Dental Association, an exhibit on the same subject will be presented by Isaac Schour and Bernard G. Sarnat.

The American Association of Industrial Physicians and Surgeons extends an invitation to all dentists to attend any or all sessions.

This "War Conference" will present an unequaled opportunity for every one interested to any degree in industrial health problems, especially those of present wartime exigencies, to hear them discussed by recognized experts in all departments of this important and growing field.

The Hotel Jefferson offers accommodations, but reservations are coming in very fast, and so, to be sure of your own, write to John Reinhardt, chairman, "War Conference" Housing Bureau, Syndicate Trust Bldg., St. Louis, Mo., without delay.

COUNCIL ON DENTAL THERAPEUTICS

REPORT OF THE FIFTEENTH ANNUAL MEETING OF THE COUNCIL ON DENTAL THERAPEUTICS

THE fifteenth annual meeting of the Council on Dental Therapeutics was held at the American Dental Association Headquarters Building, 222 East Superior St., Chicago, Ill., Friday and Saturday, February 25 and 26, 1944.

The following members of the Council were in attendance:

J. Howard Brown, Ph.D., Sc.D., Johns Hopkins University, Baltimore, Md.

Edward C. Dobbs, D.D.S., University of Maryland, School of Dentistry, Baltimore, Md.

Paul J. Hanzlik, M.D., Stanford University School of Medicine, San Francisco, Calif.

Thomas J. Hill, D.D.S., Western Reserve University School of Dentistry, Cleveland, Ohio.

Milan A. Logan, Ph.D., University of Cincinnati, School of Medicine, Cincinnati, Ohio.

Arno B. Luckhardt, M.D., Ph.D., Sc.D., LL.D., University of Chicago, Chicago, Ill.

Harry Lyons, D.D.S., Medical College of Virginia, School of Dentistry, Richmond, Va.

H. Berton McCauley, D.D.S., University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

Victor C. Myers, Ph.D., Sc.D., Western Reserve University Schools of Medicine and Dentistry, Cleveland, Ohio.

Floyd D. Ostrander, D.D.S., M.S., University of Michigan, School of Dentistry, Ann Arbor, Mich.

Charles Sheard, Ph.D., Sc.D., Mayo Foundation, University of Minnesota and Mayo Clinic, Rochester, Minn.

Donald A. Wallace, Ph.D., secretary of the Council; director, A.D.A. Bureau of Chemistry, Chicago, Ill.

The following were present at all or part of the sessions on invitation of the Council:

Dr. George K. Anderson, secretary of the Council on Foods and Nutrition, American Medical Association, Chicago, Ill.

Mr. Howard Carter, secretary of the Council on Physical Therapy, American Medical Association, Chicago, Ill.

Dr. J. Roy Doty, associate chemist, A.D.A. Bureau of Chemistry, Chicago, Ill.

Dr. R. P. Herwick, chief, Drug Division, Food and Drug Administration, Washington, D. C.

Mr. John J. Hollister, Business Manager, American Dental Association, Chicago, Ill.

Dr. Lon W. Morrey, director of the Bureau of Public Relations, American Dental Association, Chicago, Ill.

Dr. Austin E. Smith, secretary, Council on Pharmacy and Chemistry, American Medical Association, Chicago, Ill.

Because of the illness of the chairman, Dr. Harold S. Smith, Dr. Paul J. Hanzlik, of San Francisco, vice-chairman of the Council, presided at the sessions.

The Council welcomed to its membership two new members, Dr. H. Berton McCauley, of the University of Rochester, and Dr. Charles Sheard, of the Mayo Clinic, who have been added to the Council in order to provide the scientific background necessary for the evaluation of devices and physical therapy apparatus.

During the past year, the Council has continued through its work to emphasize the necessity of high standards for the composition and marketing of dental drugs and cosmetics. Many problems pe-

culiar to the times have demanded rapid action, and the Council members have given unstintingly of their time and energy during this period. The Council particularly appreciates the efforts of its non-dental members in this connection.

The following is a brief summary of some of the important topics discussed.

DEVICES AND RELATED PRODUCTS

The vastness of the field of devices and related products makes it imperative that the Council proceed slowly with the consideration of devices and related products. Such items as interdental stimulators, toothbrushes and denture adhesives are receiving the attention of the Council.

During the past several months, the Council's attention has been directed to the promotion of ultraviolet disinfecting lamps for use in dental operating rooms and waiting rooms for the purpose of decreasing the bacterial count to a point where cross-infection would be reduced significantly. After a thorough discussion of the evidence available, the Council voted that ultraviolet disinfecting lamps as presently promoted for use in dental practice be declared unacceptable. It is planned to publish a report on the subject in a later issue of THE JOURNAL.

FLUORIDES

The possibility of the incorporation of fluorides in dentifrices and mouth washes for the control of dental caries has been mentioned during the past year. Bone meal, taken internally, has been mentioned in the literature, and dilute solutions of sodium fluoride applied topically have been studied experimentally.

In the light of presently available information, the Council has adopted the following resolution: The Council on Dental Therapeutics of the American Dental Association is of the opinion that, for the control of dental caries, the routine use by the dental profession or by the laity of foods, drugs, mouth washes, dentifrices and other preparations to which fluorides have been added is not justified because of their questionable value and their known potential deleterious effects from the systemic absorption of fluorides. The Council will continue to evaluate new data as they become available.

DENTIFRICES

The restrictions on glycerin for use in dentifrices have been lightened in the past months, and the question of substitutes for this material has resolved itself satisfactorily, for the most part, from the Council's as well as the manufacturers' standpoint.

A close check has been made in the Bureau of Chemistry on dentifrices packaged in other than tin tubes. In no instance was the lead content of any accepted dentifrice found to exceed the limits set by the Council in 1942 (*J.A.D.A.*, 29:1273, July 1, 1942).

SULFONAMIDES

The rôle of the sulfonamides in the practice of dentistry has been of continuing interest to the Council. It appears that the topical application of sulfanilamide or sulfathiazole in the form of a sterile powder to the soft oral tissues following trauma may be beneficial when gross infection is suspected or when unusually extensive tissue injury has occurred. The use of complex ointments or packs which contain sulfonamides is not supported by adequate evidence.

The Council voted to consider sulfonamides for restricted internal administration under the supervision of a dentist.

REVISION OF ACCEPTED DENTAL REMEDIES

Because of the unprecedented demand for copies of the ninth edition of the Accepted Dental Remedies, which became available in September 1943, and because of restrictions imposed on the number of copies to be printed, the

edition was completely sold out by the end of the year. The book is now being revised and it is planned that the tenth edition shall be ready for distribution early in the summer of 1944.

It was decided that certain products should be deleted from Accepted Dental Remedies for lack of adequate confirmation of earlier reports of their usefulness in dentistry or because they are now obsolete. Aromatic sulfuric acid, tincture of aconite, compound dental liniment of aconite and iodine, dilute solution of ammonia, ferrous sulfate, tincture of myrrh and resorcinol were found to come within these categories.

INFORMATIVE ARTICLES

During the interval between meetings, the following informative articles appeared in the Council's section of THE JOURNAL:

"Dentifrices"

"The Business Management of Dental Meetings in the Light of Declining Revenue from Commercial Sources," by John J. Hollister, Business Manager, American Dental Association, Chicago, Ill.

"Practical Significance of Abrasives in Dentifrices," by Sidney Epstein, D.D.S., Department of Physiological Sciences, College of Physicians and Surgeons, A School of Dentistry, San Francisco, Calif.

The Council voted to invite several qualified persons to prepare articles for publication in future issues of THE JOURNAL.

COUNCIL CONSULTANTS

The Council agreed to acknowledge formally the services rendered during the past year by consultants of the Council by listing their names in Accepted Dental Remedies. The assistance of qualified consultants is very valuable to the Council.

EXHIBITS AND MEETINGS

The exhibit of the Council and the Bureau of Chemistry has been shown at the following constituent and component society meetings:

Chicago Midwinter Meeting, Chicago, Ill.

Cleveland Dental Society Annual Spring Clinic Meeting, Cleveland, Ohio.

Donald A. Wallace, secretary of the Council, appeared before the following groups and societies, in addition to lay groups:

Northwestern University Dental School, Chicago, Ill.

Louisville District Dental Society, Louisville, Ky.

Inter-American Post-Graduate Group, Northwestern University, Chicago, Ill.

American Association of Dental Editors, Chicago, Ill.

APPRECIATION

The Council wishes to express its gratitude and appreciation to those national, state and local society officers who have cooperated with it during the past year and also to the governing bodies of the American Dental Association for their continued support of the Council.

KOLYNOS DENTAL CREAM—DELETED FROM A.D.R.

THE following announcement, which has been adopted by the Council and authorized for publication, was sent to the firm before it was submitted to THE JOURNAL. In its reply, the firm states, with regard to Kolynos Dental Cream, that it is willing to advise the Council of its formula when it wishes it and to give its composition to any member of the profession who may request it. In the opinion of the Council, such willingness does not constitute adequate protection of the public.

DONALD A. WALLACE, *Secretary*

The following letter dated November 9, 1943, addressed to the Secretary of the Council, has been received from the Kolynos Company:

Upon the receipt of your October 28th letter, which represented your annual request for information for purposes of continuing the listing of Kolynos Tooth Paste in Accepted Dental Remedies, we have given serious consideration to the advisability of our reapplying for this continued listing.

You are well aware, of course, of the numerous difficulties being experienced by us today in the manufacturing of our dentifrice. With the various shortages of materials and governmental restrictive orders, it becomes necessary for us to make frequent changes in our formula as dictated by the circumstances current at any particular time. While we have adhered fairly closely to the formula, as shown in the description of the 9th edition of Accepted Dental Remedies, we anticipate that other material changes may be necessary in the future.

We are also aware of the fact that the Council, as voiced in resolution, looks unfavorably on the use of special syrups as a substitute for glycerin which we are forced to use today. While the Council has been tolerant of the conditions which must necessarily prevail, still we feel they are placed in a somewhat compromised position in having to depart from their usual rules in order to accommodate us during the wartime period.

With this thought in mind, we feel that it is perhaps better to decline your invitation for reconsideration, at least during this wartime period. It is to be hoped that wartime conditions will not have to prevail for too long a time so that we may again be in a position to reconsider this matter under conditions of normal operation.

The Council's cooperation and consideration during our period of listing in Accepted Dental Remedies is heartily appreciated, and I wish to express to you personally my appreciation for your helpfulness in the past.

The Council's stand with regard to the use of sugar in dentifrices was announced in THE JOURNAL (30:1289, August 1, 1943.)

The explanation offered by the firm for its decision to discontinue cooperation with the Council did not appear to be complete or entirely logical and it was therefore suggested to the firm that more comprehensive information be supplied. The firm replied, but did not supply any further reasons for its decision.

In connection with the deletion of Kolynos Dental Cream from Accepted Dental Remedies, it may be well to point out that the members of the dental profession have a right and a duty to know the composition of any dentifrice upon which they may wish to express an opinion for the benefit of their patients. This right and this duty exist in times of stress as well as in normal times. It is true that dentifrices suitable for daily use do not have any therapeutic value. It is possible, however, and it may sometimes be economical or otherwise convenient from the manufacturer's point of view, to include in a dentifrice formula untried substances which have not been shown to be safe.

It is the impression of the Council that shortages of raw materials that are acceptable for use in dentifrices are rapidly becoming less acute, and even if this were not so, there would be no justification for the use of an ingredient that is not acceptable to the Council, since the evaluation of dentifrice ingredients by the Council is based largely on their demonstrated safety to the user under practical conditions of use.

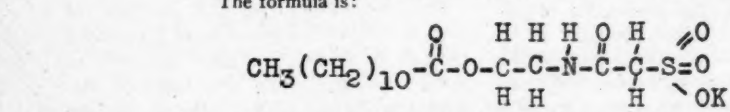
The courteous attitude of the firm toward the Council is appreciated. However, the fact that the firm is no longer willing to be guided by the safeguards which the Council has established to protect the public from inadequately tested or secretly formulated dentifrices is to be deplored. The deletion of Kolynos Dental Cream from A.D.R. is announced.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies:

SOAP AND OTHER DETERGENTS*

Sulfocolaurate: A mixture which is stated to contain 91 per cent by weight of the lauric acid ester of the potassium salt of sulfoacetic acid amidified with β-amino ethyl alcohol. The formula is:



METHOD OF PREPARATION: The chloroacetamide of β-amino ethyl alcohol is esterified with lauric acid. The resulting ester is reacted with potassium sulfite to produce a crude product, which is crystallized several times from isopropyl alcohol. The finished product contains 7 or 8 per cent of potassium chloride.

ACTIONS AND USES: It is used in dentifrices, as a foaming agent, in concentrations of 1 to 2 per cent. No therapeutic value is claimed.

PROPERTIES: Sulfocolaurate is a white crystalline powder, insoluble in cold ethyl or isopropyl alcohol, insoluble in ether, sparingly soluble in cold water and very soluble in water at body temperature (37.5° C.). It is compatible with hard water and produces a copious foam.

TESTS AND STANDARDS:

Chloride: A portion of the sample is dissolved in water and titrated by the Volhard method for inorganic chlorides and calculated as potassium chloride. On analysis, the average sample shows approximately 7.2 per cent of potassium chloride. In some cases, it is as high as 8 per cent, or as low as 7 per cent.

Total sulfur: 0.65 Gm. of the material is ignited and fused with a 10 Gm. mixture of equal parts of potassium nitrate and sodium carbonate, until all the carbon is burned off. The melt is dissolved in water to a volume of 250 cc., filtered and acidified; and the sulfate is determined as barium sulfate.

Inorganic sulfur: 0.65 Gm. of the material is saponified with 50 cc. of half normal alcoholic potassium hydroxide, refluxed on a steam bath for one and one-quarter hours. The alcohol is driven off on a water bath. The residue is dissolved in 200 cc. of distilled water, acidified with diluted hydrochloric acid, kept on a steam bath until a clear fatty acid layer is formed on the top and chilled to solidify the fatty acid. The solid fatty acid is filtered off from the liquid, through filter paper. The first filtrate does not come through clear. The filtrate is refiltered through the filter. The fatty acid is washed with cold distilled water. The washings are collected and combined with the filtrate and made up to a volume of 250 cc. In a 150-cc. portion, the sulfates are precipitated in a medium made slightly acid with hydrochloric acid, in the usual manner.

Organic sulfur: The organic sulfur is determined by subtracting the inorganic sulfur from the total sulfur.

Nitrogen: The nitrogen is determined by the Kjeldahl method.

Specimen analysis:

Chloride computed as potassium chloride	7.2%
Total sulfur in sample as presented	7.59%
Inorganic sulfur in sample as presented	0.243%
Inorganic sulfur computed as potassium sulfate	1.32%
Organic sulfur in sample as presented (7.59—0.243)	7.347%
Nitrogen in sample as presented	3.17%

Manufactured by the Emulsol Corporation, Chicago, Ill. U. S. Patent 2,184,770, dated December 26, 1939; expires December 26, 1956.

Admission of a product to the list of Accepted Dental Remedies does not imply a recommendation. It means that the product and the methods by which it was marketed at the time of consideration were not found to be in violation of the Council's published rules. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics. All information is available, upon request, and inquiries are welcomed. A postal card will bring a prompt reply.

DONALD A. WALLACE, *Secretary*

*A.D.R. 9th Ed., p. 190.

NEW EXECUTIVE SECRETARY FOR COUNCIL ON DENTAL HEALTH

ALLEN O. GRUEBBEL, for the past five years director of the Dental Division of the Missouri State Health Department,

Allen O. Gruebbel, D.D.S., executive secretary of the Council on Dental Health.

has been appointed executive secretary of the Council on Dental Health of the American Dental Association. He assumed his new duties April 1. In granting Dr. Gruebbel a leave of absence until December 31, 1944, James Stewart, Missouri Commissioner of Health, stated that it was with the understanding that Dr. Gruebbel continue to act in an advisory capacity with the Missouri dental program.

Dr. Gruebbel is well fitted for his new position. After attending Missouri State Teachers College for one year, he entered Kansas City-Western Dental College, where he graduated in 1923. After several years in private practice, he attended Johns Hopkins University, receiving the degree of master in public health in 1938. During the past five years, he has made an outstanding record as a public health dental administrator.

Preliminary plans have been completed to utilize the services of the newly appointed executive secretary in the capacity of a field representative of the Council as well as a full-time secretary to handle the many details in connection with the Council's duties.

Many requests are received from state societies for assistance in organizing state and local councils, as well as for guidance in the development of dental health activities. The Council on Dental Health is especially anxious to integrate the work of all councils on dental health and to encourage state and component societies to study local problems in order that future actions and policies may be based on the needs of the community. In an effort to attain these objectives, the executive secretary of the A.D.A. Council will devote a considerable portion of his time to professional relations and field work.

During the two years of the Council's existence, its eight committees have collected and analyzed a considerable amount of information. The Council is continuing its program of investigation of social, economic, public health and related fields. The Council's success in developing a general pattern and broad policies from a national level will be the results of investigative and experimental work of the various committees. Thus, the third major responsibility of the executive secretary will be to assist committees to collect, tabulate and analyze data and to coordinate the work of all committees and related activities.

COMMITTEE ON LEGISLATION

MEDICODENTAL RELATIONS IN THE ARMED SERVICES

THE present subordination of dental to medical officers in the armed forces is a matter of serious and immediate concern to the dental profession and to the persons that profession serves.

The problem is not a new one. In time of peace, there were many conditions that tended to minimize the actual difficulties, but the coming of war brought new emphasis to it and to its potentially dangerous influence upon standards of dental care and upon the standing and prestige of the profession.

In time of peace, the status of Dentistry in the governmental services was not apparent to many, and the facts of dental subordination were known only to the few thousand dental and medical officers who were involved. In time of peace, too, the fact that Dentistry had its own regulatory laws in forty-eight states, its own schools, its own organization of societies in city, state and nation served to draw attention away from the basic problems of this discriminatory subordination in the armed forces. In addition, Dentistry, as a professional health service, had established itself soundly in public opinion, and its practitioners worked with those of medicine in civil life on a basis of mutual cooperation. All of these constructive conditions overshadowed the problems that confronted medicodental relations in the governmental services.

The coming of war brought with it an historic expansion of the dental and medical corps. The relatively satisfactory relations between the professions were not transferred, nor could they be transferred under existing conditions, to military life. Dental officers were forced to appeal to, or through, a medical officer for equipment, personnel, revision of working hours and a wider scope in dental treatment. Dentists, with long years of training and experience, were not allowed to administer affairs intimately associated with their professional work, a privilege long ago accorded to the physicians and surgeons of the medical corps. Conditions even permitted the guess of a medical officer to rule the informed opinion of a dental officer when dealing with problems that had an exclusively dental significance.

With one-fourth of all dentists, and about two-thirds of the younger men, in the Army and Navy, this problem has now received widespread discussion and its ultimate effects upon the profession and on the public are being revealed.

Dentistry and dental officers are willing to submit to all essential limitations that are based directly on military necessity. But it is now plain that dentistry cannot continue the advances that have made its services outstanding in the world under the arbitrary restrictions that are now placed upon dental officers in the armed forces.

This problem is not confined entirely to military organization. The recent successful effort of the International Anesthesia Research Society to bar dentists and other scientists not holding the medical degree from anything more than an associate membership is a case in point. Such an action reveals its basic discriminations when it is recalled that organized medicine, through its official national organization, has recognized a dentist as one of those most responsible for the introduction of general anesthesia.

Additionally, many programs for local, regional or national distribution of medical care are being established without

thought of the dental benefits that might ultimately be furnished under them. This, in effect, makes it almost mandatory to provide dental benefits later under medical control and without proper supervision and guidance.

It is not a consideration here as to whether these conditions prevail unwittingly or not. It is not a consideration here as to whether these conditions have been perpetuated by design or accident. It is a consideration, however, that the continuation of these policies in the face of existing evidence cannot help but have a serious effect on future medicodental relations and ultimately on dentistry and its standards of dental personnel and service.

What student, for example, would be encouraged to study dentistry if, after he has been fully trained, his administrative and professional work should be governed and supervised by those trained in other fields and whose decisions would naturally be as arbitrary as such a situation would make them. Yet such supervision has been advocated by various medical men who, in military life, unfortunately are vested with authority to enforce such an arbitrary opinion.

To cite another example: What is the military or professional usefulness of permitting only medical personnel to interview and evaluate dental applicants? What is the military or professional usefulness of having medical men conduct indoctrination courses for prospective dental officers when equally or better qualified dental officers are available for the task?

Such conditions are not conducive to the recruiting of competent, well-trained and enthusiastic students and, if the objective is defeated, the eventual result must be the lowering of dental standards in dental education, personnel and service. This means nothing more or less than an enforced return to the days of an exclusively mechanical dental service, an era that many medical men decry at every opportunity. Yet if dental efforts at correcting these conditions are not successful, it will be this self-centered, shortsighted policy of some medical men that will bring about a partial reversion to earlier days and practices.

The implications of this highly unsatisfactory situation would be less sinister if its correction required impracticable, costly or revolutionary changes of existing policy or procedure. Yet this is not the case. It requires only the overcoming of ingrained prejudices and the use of an easily accessible revision of present policies. To make matters specific would require only authorization for dental officers to be permitted to present their cases and problems, without lesser intervention, to the officer generally responsible for the activity. In a hospital, this would be the medical officer in charge. In a line organization, this would be the commanding officers. These officers, by virtue of their position and wider responsibility, would bring to their decisions the impartial viewpoint that now does not always characterize such decisions. Such changes would mean nothing more or less than that dental officers would receive the same consideration, and for the same reasons, in the discharge of responsibility that medical officers have demanded for themselves in their work from time immemorial.

If, in the future, it is still to be considered proper for medical men to continue their administration of internal dental affairs, it must also be considered proper for other officers to govern internal medical affairs. The dental profession cannot approve the first proposition for reasons that have been made plain. It will not support the second unless all productive changes are obstructed by a continued policy of unsupported opposition and simple reaction.

RESEARCH COMMISSION

MIDYEAR REPORT OF THE RESEARCH COMMISSION FEBRUARY 1944

BECAUSE of war conditions, the work of the Commission is continuing on a restricted basis, but the important programs at both the National Bureau of Standards and the National Institute of Health are being carried on as usual.

FELLOWSHIP AT NATIONAL BUREAU OF STANDARDS

Physical and Chemical Research in Dental Materials.

July 1, 1943 to December 31, 1943.

The loan of the services of the A.D.A. Research Associates to the National Bureau of Standards for employment in its war program has continued in force.

In addition to war work, the associates have been able to carry on a dental testing program. This has consisted mainly of testing newly certified materials, which have included eight acrylic denture resins, three inlay casting gold alloys, two wrought gold wire alloys, two mercuries and one impression compound. As a result of these tests, one resin, three casting alloys, one wrought wire and one mercury have been added to the list of certified materials. A revised list was prepared and appeared in the January 1, 1944 issue of THE JOURNAL.

The investigation of wear of acrylic teeth has been kept in operation and arrangements have been made to extend the investigation by inclusion of more cases. Further measurements of dentures already in service are being made. A supplemental report to the progress report already published is planned.

Since the war work of the two Associates is of such a confidential nature that no specific report of their activities is possible, statements from the director concerning their contributions are enclosed.

Respectfully submitted,
(Signed) JOHN R. BEALL,
Senior Research Associate.

These letters are as follows:

U. S. DEPARTMENT OF COMMERCE
National Bureau of Standards
February 2, 1944.

Dr. M. D. Huff, Chairman,
Research Commission of the A.D.A.,
Medical Arts Building,
Atlanta, Ga.

Subject: Services of Mr. John R. Beall.

My dear Dr. Huff:

It is now nearly a year since, at the suggestion of your Association, I assigned Mr. Beall to the staff of the Special Projects Section at this Bureau to work on the development of a secret ordnance device for the Armed Services. Mr. Beall's ability as a mechanical engineer has proved invaluable to us during this period. Some of his most useful contributions have been in connection with the locating and securing of supplies and equipment, a task which, because of the shortage of materials and the necessity for making suitable substitutions, has required a high degree of ingenuity and technical knowledge. He has also solved numerous special mechanical problems for us and has planned and supervised special laboratory tests of the equipment that is under development.

I am taking this occasion to express my deep appreciation of the service your Association is rendering to the defense program by loaning Mr. Beall to this project for the duration of the emergency.

Sincerely yours,
(Signed) LYMAN J. BRIGGS, *Director.*

U. S. DEPARTMENT OF COMMERCE
National Bureau of Standards
February 3, 1944.

Mr. M. D. Huff, Chairman,
Research Commission of the A.D.A.,
Medical Arts Building,
Atlanta, Ga.

Dear Sir:

Your Association has been kind enough to give us the services of Mr. H. J. Caul to help in the construction of a pilot plant for the War Department. Since this work is on a restricted basis, we cannot give a detailed account of Mr. Caul's work. He is the engineer on the project and is doing an excellent job. For this, we wish to express our appreciation to you and to him.

Respectfully,

(Signed) LYMAN J. BRIGGS, *Director.*

REPORT OF FELLOWSHIP AT NATIONAL INSTITUTE OF HEALTH

Research in Biologic and Dental Diseases

Investigations in the bacteriology of Vincent's infection have continued along previously designated lines of research. For the most part, all efforts have been concentrated on technics, media and enriching substances for the isolation of members of the oral spirochetal flora. The cultivation of *Borrelia vincenti* has been one of the primary objectives of these endeavors.

Recently, a certain amount of success has been experienced in obtaining at least four different morphological types of oral spirochetes in each of twelve primary plates. Three of these types were found to be *Treponema microdentium,* probably *Treponema macrodentium* and *Borrelia buccale,* the other four, from all morphological appearances, resembling *Borrelia vincenti.* No difficulty was experienced in subculturing *T. microdentium* or that strain thought to be *T. macrodentium. Bor. buccale* has been obtained in subcultures only in association with the smaller oral treponemes. The organism resembling *Bor. vincenti* has been obtained in an initial subculture and has grown profusely. Subsequent passages have not been so successful. Although the enriching substance employed in these investigations has been used in a limited number of instances, it has definitely shown an enhancing effect upon the growth of various members of the oral spirochetal flora. These experiments are still in progress.

In addition, pure cultures of the smaller oral treponemes have been utilized in evaluating the growth promoting qualities of small pieces of sheet iron, pure iron wire and numerous ferrous and ferric salts. Twenty experiments involving more than 200 cultures were utilized in evaluating the dilutions of iron salts most beneficial to spirochetal growth under aerobic conditions. The results at present are inconclusive, but indicate that the growth stimulus derived from the iron compounds may be linked with the oxygen reduction potential. Preparations are being made to run oxidation-reduction potential determinations on such cultures.

Recently, reports have appeared in the literature concerning a gingivostomatitis caused by the herpes virus. Some investigators indicate that the condition is the same as Vincent's infection. Strains of herpes virus were obtained and an experiment was set up to attempt to produce this condition in animals. Small localized indurated areas with ulcer formation have been initiated at various sites of inoculation in the oral mucous membrane of rabbits. However, the diffuse type of gingivostomatitis described in human beings has not been produced in these animals. This work is still under consideration.

Two cases of spontaneously occurring noma, one in a cat and the other in a monkey, were obtained for study. Inflammatory exudate from both animals was inoculated by various routes into mice, guinea-pigs, cats and rabbits in an attempt to reproduce the disease. In cats, enormous swelling of the cheeks of certain animals was obtained, but these did not break down and ulcerate or perforate the buccal tissues. Attempts to

isolate the larger spirochetes or herpes virus in animals was unsuccessful. The swollen spirochetes were obtained in abscesses in guinea-pigs, and in mixed cultures. The mice succumbed in from eighteen to twenty-four hours. The time was inadequate for abscess and for ulcer formation. Studies of the body tissues did not reveal the presence of any spirochetal organisms.

A manuscript is in progress on the morphology of certain of the oral spirochetes and will be ready for publication in the near future.

Respectfully submitted,

(Signed) EDWARD G. HAMPP
Passed Assistant
Dental Surgeon (R),
A.D.A. Research Associate

The secretary of the Commission, Daniel F. Lynch, was called to active duty with the United States Navy on January 7, 1944, and he is at present stationed at the United States Naval Hospital in San Diego, Calif.

Arrangements have been made with the members of the Executive Board so that the work of the Commission can be carried on in its usual good manner. The secretary is functioning from his headquarters in San Diego, while his secretary in Washington is also handling the routine mail and correspondence which is regularly received at the Washington office. The chairman of the Commission has assumed some of the duties of the secretary and in this way the work is made to flow very smoothly.

Plans for the formation of a committee to study Vincent's infection from a clinical standpoint are still in a formative stage. Much consideration has been given to the project, but the selection of the personnel for the committee has not been made. It is felt that the committee should be representative and efficient and, because of these considerations, the board has felt that it should proceed carefully.

Respectfully submitted,

(Signed) M. D. HUFF,
(Signed) DANIEL F. LYNCH,
Secretary.

CORRESPONDENCE

"DENTAL PRACTICE AND DENTAL EDUCATION IN THE FUTURE; WITH CONSIDERATION OF SOCIAL AND HEALTH ASPECTS"

To the Editor:

WE feel that further comment is imperative regarding the proposed radical plan suggested by John Oppie McCall, of New York City, in an article published in THE JOURNAL January 1944, pages 16-30, particularly in reference to those sections pertaining to dental service for children. It is merely a revival of the New Zealand Plan, publicized in this country by Guy S. Millberry *et al.*, in 1939, which was received unenthusiastically.

It is indeed gratifying to learn that the President of the American Dental Association, Capt. Raymond C. Wells, U. S. Navy, in his communication to the Editor of THE JOURNAL, published in the February 1944, issue, pages 280-281, is so familiar with this important branch of dentistry. His courageous and intelligent remarks indicate that he has practical knowledge of pedodontics and knows whereof he speaks. We hope that his published letter is read by every member of the dental profession.

We appreciate Dr. McCall's concern as to the apparent inability of Dentistry to cope with the increasing prevalence of dental disease in children. However, it would seem that professional pride and consideration for the autonomy of Dentistry would have prompted a thorough investigation within our own confines before going so far afield. This would have exposed unexplored areas awaiting development. Also it is surprising that groups within the American Dental Association, interested primarily in dentistry for children, would not have assumed the re-

sponsibility for such research, thereby protecting the profession from embarrassing and humiliating proposals that threaten its very integrity and possible disintegration.

Heartened by our President's keen interest and understanding, we suggest that those in authority formulate plans for a survey to determine just how many dentists in every city, town, and hamlet of our country are devoting a portion of their time each week to child patients. Judging from comments of parents of our child patients, also from other sources, over a period of about fifteen years, we are convinced that the findings will show an appallingly high percentage of dental practitioners who are rendering very little or no dental service whatever for children.

Dentistry for children is so comprehensive as regards the other important phases of dentistry that the teaching of this subject is allocated to the last year of the dental college course. Experiments have proved conclusively that extensive prerequisite training, cultural and professional, is essential. To those of us who have been teaching pedodontics for many years and are thoroughly conversant with its vast scope, the very suggestion that one of its many closely integrated phases be relegated to so-called auxiliary groups, young women "naturally endowed to handle children most effectively" and fortified with a short period of training in technical procedures, is fantastic and visionary and certainly not practicable. The practice of dentistry for children is a man's job.

Dentistry in the United States has attained the world's highest standard. The conspicuous discrepancy between the level of our dentistry and that of the British Empire precludes even a consideration of our adoption of the New Zealand Plan. We have heard and read reports of visitors to New Zealand relative to the success of this undertaking and they have been unconvincing. It is significant that some of the most enthusiastic advocates of this radical plan are members of dental specialties far-removed from dentistry proper.

Last, but not least, we should consider the stand of the dental hygienist in this controversy. The majority of the members of the dental hygiene association resent the inclusion of their profession in these discussions. They have not been consulted. Should they be approached regarding this matter, they would not favor the assumption of these new duties. They are certain that their time and efforts will be utilized most effectively in the discharge of the obligations now assigned to them.

E. C. McBEATH, D.D.S., B.S., M.D.,
Professor of Dentistry.
L. R. STOWE, D.D.S.,
Associate Professor of Dentistry.
S. N. ROSENSTEIN, B.S., D.D.S.,
Assistant Professor of Dentistry.
School of Dental and Oral Surgery,
Columbia University, New York, N. Y.
March 21, 1944.

DEATHS

ALLEN, W. H., Fort Smith, Ark.; San Francisco Dental College, 1899; died March 4; aged 67.

BAUGHMAN, LEO M., Los Angeles, Calif.; University of Southern California, College of Dentistry, 1918; died February 21; aged 56.

BAYLESS, DUDLEY DEAN, Knoxville, Tenn.; Northwestern University Dental School, 1903; died February 25.

BEATTIE, WILLIAM R., Cleveland, Ohio; Baltimore College of Dental Surgery, 1900; died February 22; aged 66.

BELLEW, OSCAR E., Milwaukee, Wis.; St. Louis University School of Dentistry, 1911; died March 5; aged 50.

BERRY, GEORGE M., West Union, Iowa; Northwestern University Dental School, 1896; died March 1; aged 71.

BIXBY, CLARENCE E., Jamestown, N. Y.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1916; died March 3; aged 54.

BLAISDELL, HARRY W., Brooklyn, N. Y.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1910; died March 6; aged 58. Dr. Blaisdell was a captain in the U. S. Navy Dental Corps.

BRITE, ORIS M., Joplin, Mo.; died February 17; aged 52.

BURGESS, JAMES K., New York, N. Y.; Baltimore College of Dental Surgery, 1891; died March 28; aged 73.

CHICK, CLAUDE C., Hood River, Ore.; died February 26; aged 68.

CLEMENT, GEORGE B., Meridian, Miss.; University of Tennessee, College of Dentistry, 1881; died February 16.

COOK, JAMES D., Brooklyn, N. Y.; New York College of Dentistry, 1890; died March 15; aged 82.

CORMAN, RICHARD W., Jr., Roswell, N. M.; Kansas City Western Dental College, 1920; died March 1 in auto accident; aged 44.

COWAN, WALLACE F., Vandergrift, Pa.; University of Pittsburgh, School of Dentistry, 1923; died March 10; aged 44.

COX, W. ALEXANDER, Cambridge, Mass; died February 8.

CREGUT, JULES F., Houston, Texas; Texas Dental College, 1914; died March 5; aged 75.

CROZIER, J. E., Benton, Ark; Kansas City Dental College, 1885; died February 18; aged 81.

DADMUN, WALTER E., St. Paul, Minn.; University of Michigan, College of Dental Surgery, 1883; died March 21; aged 85.

DRESSEL, HAROLD J., Kane, Ill.; St. Louis University Dental College, 1909; died February 24; aged 58.

EASTER, G. M., Hamburg, Ark.; died February 21; aged 71.

ENGELSKIRCHER, EDWARD M., Erie, Pa.; University of Maryland, School of Dentistry and Baltimore College of Dental Surgery, 1900; died February 14.

FISCHER, E. J., Tipton, Mo.; Washington University, School of Dentistry, 1901; died March 4; aged 60.

FLOHR, EUGENE W., Madison, Wis.; Marquette University, School of Dentistry, 1903; died February 19; aged 62.

FREEMAN, HARRY K., Dunkirk, N. Y.; Temple University School of Dentistry, 1895; died March 1.

FREY, GUSTAV HERMAN, Higginsville, Mo.; Northwestern University Dental School, 1896; died February 17; aged 79.

FUNKHOUSER, J. T., St. Louis, Mo.; Washington University School of Dentistry, 1913; died March 10; aged 54.

GEARY, CORNELIUS J., Milwaukee, Wis.; Marquette University, School of Dentistry, 1917; died February 23; aged 52.

GRANDY, A. W., St. Thomas, N. D.; University of Minnesota, College of Dentistry, 1910; died March 9; aged 55.

GRIER, G. LAYTON, Milford, Del.; Pennsylvania College of Dental Surgery; died March 18; aged 76.

HAGGARD, O. L. F., SR., Gadsden, Ala.; Southern Dental College, 1910; died February 21; aged 50.

HANSON, WINFIELD E., Biddeford, Maine; died February 23.

HEWITT, W. E. P., Pine Plains, N. Y.; Temple University School of Dentistry, 1892; died February 23.

HONEYWELL, WILLIAM C., Johnstown, Pa.; Western Reserve University, School of Dentistry, 1897; died February 25; aged 74.

HOUDE, WILLIAM C., Syracuse, N. Y.; Philadelphia College of Dental Surgery; died March 5.

HOUGH, WILLIS L., Syracuse, N. H.; died March 6; aged 82.

HUNT, FREDERICK M., Los Angeles, Calif.; Northwestern University Dental School, 1900; died March 17; aged 72.

HUTCHIN, ROBERT C., St. Paul, Minn.; University of Minnesota College of Dentistry, 1900; died March 20; aged 67.

JOHNSON, CHARLES L., Pittsfield, Mass.; died March 16; aged 76.

KINGSBURY, ADDISON, Columbus, Ohio; University of Pennsylvania, 1897; died February 19; aged 76.

LATIMER, A. L., Akron, Ind.; Indiana University School of Dentistry, 1910; died February 19; aged 58.

LEWIS, CHARLES L., Chicago, Ill.; University of Illinois, College of Dentistry, 1911; died February 12; aged 56.

LEWIS, RAY ALBERT, Logan, Utah; Chicago College of Dental Surgery, Dental Department of Loyola University, 1916; died February 29; aged 60.

LONG, ORVILLE S., New York, N. Y.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1910; died March 23; aged 67.

LOWES, HERBERT B., Pontiac, Mich.; University of Michigan, College of Dental Surgery, 1901; died February 16; aged 70.

MCBEAN, ALEXANDER O., Chicago, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1894; died March 26; aged 69.

MCCANN, JAMES F., Willoughby, Ohio; Western Reserve University, 1919; died February 26; aged 46.

MCCARTY, OREN H., Tulsa, Okla.; Chicago College of Dental Surgery, Dental Depart- of Loyola University, 1907; died March 8; aged 62.

MCCASKILL, JAMES W., Chicago, Ill.; Northwestern University Dental School, 1924; died March 22; aged 48.

MCMASTER, J. A., Kansas City, Mo.; Columbian Dental College, 1896; died February 4.

MCPHERSON, HOBART P., Leroy, N. Y.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1907; died March 9; aged 66.

MARCY, OLIN J., New York, N. Y.; Pennsylvania College of Dental Surgery, 1892; died March 29.

MURTON, P. W., Silver Springs, Md.; Homeopathic Hospital College, Dental Department, 1892; died January 15; aged 75.

POBIRS, ALBERT I., Providence, R. I.; Baltimore College of Dental Surgery, 1905; died February 24; aged 66.

PODSTATA, HARVEY V., Long Beach, Calif.; University of California, College of Dentistry; died February 9; aged 44.

POSEY, THOMAS L., Henderson, Ky.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1897; died March 2.

PRATT, THOMAS H., Asbury Park, N. J.; New York College of Dentistry, 1898; died March 2; aged 71.

PROTHRO, A. R., Wichita Falls, Texas; Vanderbilt University, School of Dentistry; died February 18; aged 74.

REED, RAYMOND R., Duluth, Minn.; University of Minnesota, College of Dentistry, 1919; died March 4; aged 46.

RICHARDS, GEORGE F., Canton, Maine; Northwestern University Dental School, 1896; died March 13; aged 86.

RITTER, C. H. H., Los Angeles, Calif.; University of Southern California, College of Dentistry, 1929; died March 22.

ROSENHEIM, W. S., Huntington, W. Va.; Baltimore Medical College, Dental Department, 1905; died March 9; aged 69.

SADLER, C. DOVE, Baltimore, Md.; Baltimore College of Dental Surgery, 1900; died February 13; aged 64.

SAPPINGTON, C. L., St. Louis, Mo.; Washington University School of Dentistry, 1899; died March 17; aged 68.

SKELTON, CREIGHTON R., Dallas, Texas; died February 6; aged 91.

SMITH, CARL E., Akron, Ohio; Philadelphia Dental College, 1898; died March 9; aged 68.

SPIRES, LOUIS EDWARD, Joliet, Ill.; Northwestern University Dental School, 1903; died February 17; aged 76.

STAPLES, ALBERT H., Brunswick, Maine; Medico-Chirurgical College of Philadelphia, 1906; died in February; aged 81.

STEVENSON, JOSEPH S., Waynesboro, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1902; died February 19; aged 68.

STITZER, CHARLES H., Mifflinburg, Pa.; Pennsylvania College of Dental Surgery, 1890; died February 2; aged 70.

THIEBAUD, JAMES E., St. Paul, Minn.; University of Minnesota, College of Dentistry, 1901; died March 2.

THOMAS, B. A., Zephyrhills, Fla.; Atlanta Dental College, 1909; died January 26; aged 54.

THOMAS, WALTER G., Grass Valley, Calif.; died January 5; aged 67.

TIMMIS, JOSEPH F., Chicago, Ill.; Northwestern University Dental School, 1906; died March 25; aged 58.

TRUTT, OLIVER D., Philadelphia, Pa.; Temple University School of Dentistry, 1896; died February 19; aged 80.

URBANEK, JOSEPH J., Chicago, Ill.; University of Illinois, College of Dentistry, 1911; died February 5; aged 77.

VANDEVENTER, CYRUS E., Burbank, Calif.; College of Dentistry, University of California, 1922; died March 27; aged 56.

VAN KIRK, H. THATCHER, Pine Bush, N. Y.; Tufts College Dental School; died March 11; aged 34.

VOLLE, ALBERT B., Vincennes, Ind.; Indiana University School of Dentistry; died February 14; aged 43.

WACHTER, C. H., Niles, Ohio; Chicago College of Dental Surgery, Dental Department of Loyola University; died February 1; aged 84.

WALLACE, J. F., Canton, Mo.; Washington University School of Dentistry, 1891; died January 31; aged 76.

WALSH, RICHARD J., Philadelphia, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1916; died February 3; aged 53.

WEILAND, GEORGE F., Waukegan, Ill.; died February 6; aged 67.

WEISZ, GEORGE R., Chicago, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1918; died March 22; aged 46.

WERMUTH, FRANK C., Milwaukee, Wis.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1887; died January 19; aged 78.

WHEELER, ROY E., Milwaukee, Wis.; Marquette University, School of Dentistry, 1917; died February 14; aged 55.

WHITAKER, VERNON D., Minneapolis, Minn.; University of Minnesota, College of Dentistry, 1917; died February 9; aged 50.

WHITE, GEORGE W., Brooklyn, N. Y.; died March 28; aged 89.

WHITE, WILLIAM BARTON, Dallas, Texas; State Dental College, Dallas, 1912; died February 23; aged 57.

WILKINSON, ROSS, Jersey City, N. J.; Harvard University Dental School, 1902; died February 19; aged 66.

WOOLEY, WAYNE W., Glen Cove, L. I., N. Y.; University of Minnesota, College of Dentistry, 1913; died February 6.

WORCESTER, HOWARD W., Chicago, Ill.; United States Dental College, Chicago, 1893; died February 13; aged 73.

ZAHM, THOMAS S., Springfield, Ill.; Ohio State University, College of Dentistry; died February 9; aged 68.

ZINKON, JOHN H., Baltic, Ohio; died March 13; aged 81.

INCIDENTS OF PRACTICE

Dentition of Identical Twins

LOUIS R. BURMAN, A.M., D.D.S., New York, N. Y.

IDENTICAL twins, girls, aged 19, presented themselves for dental work. (Fig. 1.) Oral examination revealed deciduous molars retained bilaterally in the lower jaw of both patients. Roentgenograms of the areas showed the absence of permanent tooth buds under these four deciduous teeth. (Fig, 2, A and B.)

The family history revealed that the mother had had a retained deciduous upper left lateral incisor with no permanent bud under it. The father, a brother and a sister gave no history of retained teeth.

Examination for caries showed that while the caries index in the deciduous teeth was the same, it differed in the permanent dentition, probably as a result of environmental conditions.

Fig. 1.—Identical twin girls.

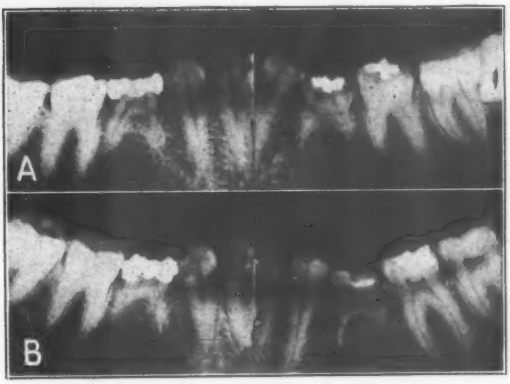


Fig. 2.—Roentgenograms showing absence of permanent tooth buds under deciduous teeth.

Of great interest is the fact that although the oral development in the twins appeared similar, roentgenograms of the third molars revealed a difference. One of the twins showed a horizontal impaction of a lower

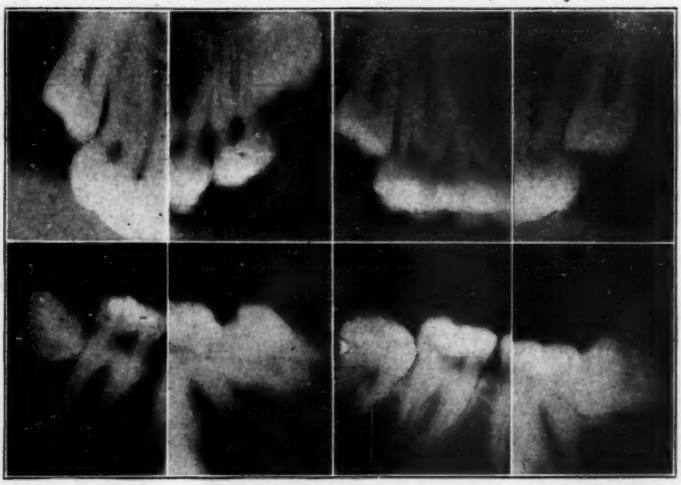


Fig. 3.—Roentgenograms of identical twins revealing difference in oral development.

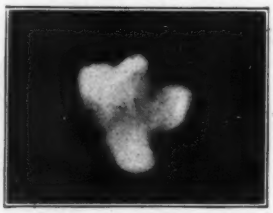
third molar, while the other has an oblique type of impaction of the lower molar on the same side. (Fig. 3.)

1235 Grand Concourse.

Fusion of Bicuspid and Molar

HORACE BEEMER, D.D.S., Mason City, Iowa

A WOMAN, aged 55, complained of severe pain in the back of the head and the neck, ear ache and impairment of the sight of the right eye. Examination of the mouth revealed an impacted lower right third molar, which proved to be fused with a tooth having the occlusal markings of a first bicuspid. Recovery was complete six weeks after removal of the fused teeth.



Impacted molar fused with bicuspid.

CURRENT LITERATURE

Journal of Dental Research

December 1943

Subjects marked with an asterisk are reviewed below.

*In Vitro Production of Plaques and Caries. V. H. Dietz, University of Illinois—423.

The Chemical Composition of Enamel and Dentin in High and Low Caries Areas in South Africa. T. Ockerse, Department of Public Health, Pretoria, S. A.—441.

The Action of Sodium Fluoride on the Dentin and Predentin of the Incisor Teeth of Rats Consuming Diets Containing Calcium and Phosphorus in Various Ratios. J. T. Irving, University of Cape Town—447.

*Effects of Large Daily Doses of Vitamin D on Teeth and Jaws of Rats and on Humans. D. E. Ziskin, J. A. Gibson, Jr., A. Skarka and J. W. Bellows, Columbia University—457.

*Studies on the Incidence and Cause of Dental Defects in Children. V. Freedom from Caries. M. Brucker, Board of Education, Newark, N. J.—469.

*The Citrate Content of Whole Teeth, Dentin and Enamel. A. H. Free, Western Reserve University.—477.

*A Structureless Recurrent Deposit on Teeth. R. S. Manly, Cincinnati.—479.

*Solution of Dentin Powder by Inorganic Acids Used in Root Canals. L. I. Grossman, University of Pennsylvania.—487.

*The Effect of Medicaments on the Motility of the Oral Flora with Special Reference to the Treatment of Vincent's Infection. S. L. Rosenthal, University of Pennsylvania.—491.

*Frequency of Occurrence of Cleft Palates and Harelips. L. G. Grace, Department of Health, Pennsylvania.—495.

The Journal of Dental Education

February 1944

Subjects marked with an asterisk are reviewed below.

*Dental Science and the Practical Viewpoint. F. Herzberg.—185.

*A Simple Method of Evaluating Clinical Data. L. I. Grossman.—190.

*Clinical-Biological Science Correlation. H. A. Zander.—198.

Learning and Teaching Dentistry.—202.

Chapter XVII. Learning and Teaching in Clinics. W. C. Fleming.—203.

Appendix. Recent Efforts of Dental Schools to Improve Their Instruction. L. E. Blauch.—219.

Survey of Dental Schools, 1942-1943. Council on Dental Education.—238.

Licensure and Dental Education

*Oral Diagnosis. C. F. Bodecker and Consultants.—244.

In Vitro Production of Plaques and Caries

By Victor H. Dietz

An apparatus was designed to circumvent some of the ordinary difficulties in the production of dental caries *in vitro*. The total apparatus, built around the microscope, permitted direct observation of the "living" lesion. The ordinary method of producing artificial caries in a whole tooth and then making a ground section of it was reversed. A ground section was prepared, and then the lesion was produced in it. The saliva used in the apparatus was collected from caries-susceptible persons and was changed every twenty-four hours. The saliva was adjusted to an average pH of 6 and decalcification of a caries-like nature occurred only at that point where additional carbohydrate had been added. The lesion was directly observed in its incipiency and progression with the attachment of bacteria in the nature of a plaque to the exterior of the enamel. Cavitation, similarly, progressed only at the very site to which the carbohydrate had been added, although the entire tooth-section was exposed to the saliva. Only the enamel immediately beneath the established bacterial plaque was affected. The plaque was polymicrobic and occurred in a centripetal fashion. Lactobacilli and streptococci were demonstrated in the plaque, with filamentous organisms apparently playing only a secondary and insignificant rôle.—*J. D. Res.*, 22:423-440, December 1943.

Effects of Large Daily Doses of Vitamin D on Teeth and Jaws of Rats and on Humans

By DANIEL E. ZISKIN ET AL.

DENTIN and bone apposition rate, and calcification rhythm were studied by means of the vital staining method. Twenty female rats, aged 57 to 59 days at the outset of the study, constituted the treated group. An untreated series consisted of twelve rats (in most instances litter-mates of the foregoing). The procedure was as follows: The two groups received the same diet. All the animals were injected with alizarin red S at the beginning of the study, after two weeks and at the end of a second two-week period. No treatment was given during the first two weeks, which was regarded as a control interval. After this time, the group of twenty animals was given vitamin D (ertron) in their food so that they consumed approximately 7,000 U.S.P. units daily. Dentin and bone apposition rates were seen to be significantly increased. The calcification rhythm of dentin was not affected. In another phase of the study, eruption rate, skeletal calcification, formation of pulp stones and effect of high vitamin D intake on the estrus cycle were observed with the aid of x-rays, vaginal smears and ground histologic sections. Findings disclosed no significant changes. No toxic effects were seen grossly. Eight persons receiving large doses of vitamin D in conjunction with treatment for rheumatoid arthritis had their teeth x-rayed before and after from 153 to 231 days of treatment. No increase in pulp stone formation was observed.

Studies on the Incidence and Cause of Dental Defects in Children. V. Freedom from Caries

By MARCU BRUCKER

IN this study, the extent of freedom from caries was determined for a group of 9,269 school children. The percentage of negro girls without caries was above that of the white girls. More negro boys than white boys were free from the disease. The reason for this is at present obscure. Such factors as diet and attention to oral hygiene were fully considered, but furnished no conclusive answer. Although the percentage of negro girls free from caries exceeded that of the negro boys, the percentage of white boys without caries was slightly higher than that of the white girls. The influence of sex on freedom from caries, while rather definite in the negro group, appeared inconclusive in the white children. It would seem at first that social status might play a part in the freedom of children from caries, but such influence was difficult to conclude from these studies. The relation of nationality to freedom from caries was difficult to ascertain. Intimations of a possible influence were noted in one or two groups, but generally appeared rather inconclusive. City life, country life and geographic and climatic conditions seem to play no certain part in freedom from caries.

The Citrate Content of Whole Teeth, Dentin and Enamel

By ALFRED H. FREE

THE citrate content of dry human teeth was found to be 680 mg. (expressed as citric acid) per hundred grams. Separate analyses of human dentin and enamel indicated that the dentin contains about eight times as much citrate as enamel does. Solubility studies showed that only a small portion of the citrate in ground powdered teeth is soluble.

Dog incisors were found to contain amounts of citrate in the enamel, dentin and whole tooth comparable to those of human teeth.

Solution of Dentin Powder by Inorganic Acids used in Root Canals

By LOUIS I. GROSSMAN

VARIOUS acids have been advocated from time to time to assist in removing obstructions or for widening root canals. An attempt was made to evaluate these dentin solvents by the following method: 30 mg. of dentin powder (100-200 mesh fine) were placed in a test tube and 2 cc. of the acid to be tested was added. The tubes were then shaken on a Boerner shaking apparatus for ten minutes, centrifuged and examined with a 4X lens. This was repeated until complete solution occurred or for a maximum of 130 minutes.

Fuming sulfuric, concentrated (commercial) hydrochloric and concentrated (commercial) nitric acid effected complete solu-

tion in from five to ten minutes, but cannot be used clinically. Fifty per cent aqua regia in reverse proportions effected solution in from thirty to sixty minutes; 50 per cent aqua regia in normal proportions effected solution in from sixty to ninety minutes. Five molar nitric acid effected solution in from 60-80 minutes; 5 molar hydrochloric acid in from sixty to ninety minutes. Both nitric and hydrochloric acids were more effective in higher than in lower concentrations. Sulfuric acid, phenolsulfonic acid and perchloric acid were ineffective.

Structureless Recurrent Deposit on Teeth

By RICHARD S. MANLY

A RECURRENT pigmented pellicle has been found to form regularly on the teeth of some of the persons who do not use dentifrice abrasives in their oral hygiene. A method was devised for examining anterior teeth with a binocular microscope and such examinations showed that the pellicle accumulated gradually, that it could be removed by one or two brushings with dentifrice abrasive and that the accumulations did not seem to affect the tooth surfaces in any way.

Under high magnification, the deposit was observed to consist of a structureless, bacteria-free, faintly gram-positive pellicle, with which were frequently associated traces of a granular, gram-negative substance. Scrapings of the pellicle gave positive reactions to protein tests and seemed to be chiefly of organic material. The pellicle was insoluble in all of the chemical reagents tested at room temperature, and it dissolved at 90° C. only in strong hydrolytic solutions. The term brown pellicle was suggested as a name for the deposit.

Effect of Medicaments on the Motility of the Oral Flora with Special Reference to the Treatment of Vincent's Infection II

By S. LEONARD ROSENTHAL

A SUPPLEMENTARY report on an *in vitro* test of the antibacterial properties of medicaments intended for topical application to the oral mucosa presents a method employing a loss of motility of the motile oral flora and growth of the non-motile flora as a basis of comparison. Twenty-seven additional drugs recommended for the treatment of Vincent's infection are evaluated. Not injurious to the oral tissues, and instantly stopping motion of the entire motile oral flora, while inhibiting growth of the non-motile flora, are: zephiran, tergitol, sobisminol, tryparsamide, sodium carbonate and zinc oxide-eugenol cements. The sulfonamides and chlorophyl were among the substances administration of which failed to have these effects.

Frequency of Occurrence of Cleft Palates and Harelips

By LINWOOD G. GRACE

A STUDY of the birth records of 202,501 children born in Pennsylvania in 1942 showed that one in 800 had cleft palate. The county distribution did not suggest any significant pattern, nor was study of the birth place of the mother fruitful. The highest percentage of infants with cleft palate were born to mothers of the 21-25 age group. Of the 250 mothers having infants with cleft palate, 41.6 per cent were primiparas, while in 38.6 per cent of cases in Pennsylvania (1940), the mothers were primiparas. Although 5.6 per cent of the children born were negroes, only 3.6 per cent of the infants having cleft palates were negroes. This group showed 155 boys to eighty-eight girls.

Rôle of Vitamin D in Dental Caries

By SIMON B. POYTA

THE literature on the rôle of vitamin D in dental caries abounds with conflicting reports. Many experimenters report a marked decrease in caries incident to the administration of vitamin D. Others assert that this is impossible and contrary to the basic laws of dental physiology. One group reports beneficial results from a single massive dose of vitamin D. Another warns that overdosage may lead to various systemic and dental disorders. The subject calls for further study. A consideration of vitamin D seems to be one of the steps toward solution of the problem of dental caries. Further research is needed to evaluate the rôle of vitamin D in both oral physiology and pathology.—*J. 2d Dist. D. Soc.*, 29:368-372, December 1943.

Case Report: Treatment of Complete Transverse Maxillary Fracture with the Edgewise Arch Mechanism

By ROBERT B. MURRAY

A MAN, a shipyard worker, was struck by a crane while handling pipe, complete transverse fracture of the maxillae resulting. When the mechanics offered by a Kingsley splint proved inadequate, the opinion of an orthodontist was sought, and, owing to the similarity between this case and one in the literature, it was decided to institute treatment with an orthodontic appliance. Edgewise arch wing-bracket bands were placed on the mandibular bicuspids and cuspids and on the maxillary bicuspids. The four first molars carried bands with suitable sheaths. Edgewise archwires were adapted passively to both arches, thereby establishing a unit of anchorage within each dental arch. Previously prepared models indicated the desired goal of treatment. Necessary movement was achieved by variously arranged intermaxillary elastics, with an elastic bandage to a headcap as an adjunct. The stability of the appliance was adequate, it was not cumbersome and was readily tolerated by the patient, and it permitted the application of force in the proper direction. Some freedom in opening the mouth was possible and a maximum of mouth hygiene could be maintained. A firm and uneventful union of the parts and occlusal relationships existing prior to the accident were established.—*Angle Orthodontist,* 13:30-33, 1943.

Dental Aviation

By N. KOBRIN

HIGH altitude flying may cause earache; 1.2 per cent of flyers develop toothache, and apical abscess and pyorrhea are precipitating causes of staleness in pilots. Flying within forty-eight hours after an extraction may cause secondary hemorrhage or perforation of a sinus. Continued bombing may lower the general resistance of the population and set up a condition of vitamin C deficiency, particularly in children. "Seed flying," carrying seed by plane, thus enabling native crops from one country to move to other lands and grow there, should substantially improve the diet and health of all peoples everywhere. In the Army, the complete dental identification record of all flying personnel and air-borne troops and officers is attached to the soldier's service record. New dental operations must be recorded immediately. The aeronautical age will profoundly change our way of life. May we hope, therefore, that humanity may learn to live in peace and happiness, enjoy the fruits of his labor and walk in beauty.—*J. 2d Dist. D. Soc.,* 30:7-11, January 1944.

Hospital Dentistry

By GEORGE H. DOW

THE responsibilities of hospital dentistry have been placed squarely upon the shoulders of the practicing dentist. In February 1943, the American College of Surgeons adopted a minimum standard for dental departments in hospitals. This is both an honor and a challenge. The author points out the following "musts" if Dentistry is to assume its rightful and full place in the hospital: The staff must be directed by a dentist whose vision impels him and his staff to assume complete equality of service. By this is meant accepting full ward responsibility in administrating treatment from admission to signing the patient out. The clinic is important, but is not the ultimate. Dentists must give time and must study so that cases on the wards may be intelligently prescribed for. Operating room technic must be second nature, and the ability to carry out intra-oral and extra-oral surgical work requires a knowledge of general surgical principles. A new interest, with great benefit to suffering humanity, comes to the man who knows physiology and pathology and recognizes tissue reactions. Dental internships are the greatest educational step to full understanding that the mouth is but a part of the human mechanism. These men live with sick patients and learn the language of medicine. The dental intern does the same laboratory work that the medical intern does.—*J. 2d Dist. D. Soc.,* 30:122-124, March 1944.

Recent Developments in the Treatment of Vincent's Infection

By SAMUEL CHARLES MILLER

VINCENT'S infection is a term heretofore used to designate almost any affection of the periodontal tissues. As most of the cases thus categorized actually fall into other disease

classifications dependent on their etiology, the term is a misnomer. For more accurate terminology, the author suggests "necrotic gingivitis," a term originated by Box, which describes the symptoms rather than the false etiology. In the periodontia department of New York University College of Dentistry, of 5,000 patients seen over a five-year period, only 500 (10 per cent) presented true cases of necrotic gingivitis. Elimination of necrotic gingivitis is effected by office and home treatment as follows: 1. Treatment of acute phase. 2. Restoration of function and tissue resistance. 3. Elimination of primary incubation zones. In the first stage, the careful cleaning of the mouth with mild hydrogen peroxide solution (1 teaspoonful to 4 ounces water) is advisable. Careful cleansing and even cautious use of metal instruments are permissible. Home care requires abstinence from smoking and drinking and frequent irrigation with warm water. The daily administration of 300 mg. of ascorbic acid, six brewers' yeast tablets and from 5 to 15 mg. of riboflavin accelerates tissue healing. Routine periodontal treatment follows elimination of the acute phase. Necrotic gingivitis is most common in October in the age group 19-30 years.—*J. 2d Dist. D. Soc.*, 30: 45-48, February 1944.

A Simple Method of Evaluating Clinical Data

By LOUIS I. GROSSMAN

MUCH clinical material of value, particularly in institutions, is lost because adequate records are not kept. The author describes a simple means of keeping complete records, which are readily analyzed. Ordinary 5 by 8 inch cards having a series of holes punched around the periphery are used. Each hole is numbered and stands for a given operation or indicates a certain treatment, etc. A code is used to identify each hole or else the identification can be imprinted directly on the card opposite the hole. All data pertinent to that patient are entered upon the card by check marks opposite the proper holes. The holes so checked are then slotted with a special hand punch. To analyze the data, a knitting needle or ice pick is pushed though the proper hole and the cards are shaken. About seventy or eighty cards are sorted each time. Those cards that are slotted will fall off the knitting needle, while those not slotted will remain impaled on it. The cards dropped from the needle or pick are counted, and the process is repeated until the desired data are obtained from sorting all the record cards.

Dental Science and the Practical Viewpoint

By FRED HERZBERG

OUR mechanized world has produced a mental attitude setting up theory and practice as opposites. Actually, these approaches are inseparable. The dental student imbued with the "practical" outlook tends to neglect the theoretical aspects of his work. The sciences are of value to the dental student from several viewpoints. As a dentist, he must understand the scientific bases of his operations. As a scientifically trained person, he should be in a position to evaluate the findings in other fields. As an intelligent citizen, he should place himself in a position to better evaluate the world. As the ever closer collaborator with the physician, the dentist must have scientific knowledge. Any of these facts explains the need for theoretical knowledge. Knowledge actually needs no justification other than itself. The responsibility of the dental teacher in this matter is apparent to all who wish to see the facts. The war has sometimes been used as an excuse to cut down the study of the basic sciences to save time. The military dentist in the field is an assistant to the surgeon. Without a basic scientific background, the military effectiveness of the dentist is considerably reduced.

Clinical-Biological Science Correlation Project

By H. A. ZANDER

CORRELATION of biologic science and clinical dentistry was attempted by a senior class project in oral diagnosis. Each student established the clinical and later the histopathologic diagnosis of a tooth which was to be extracted. Summarized findings were presented to the class at a seminar. Several benefits were derived from the report: (1) correlation of clinical and preclinical teaching; (2) an increase in the student's appreciation of research; (3) promotion of independent thinking; (4) closer student-teacher

relations; (5) the development of a source of good teaching material; (6) integration of biologic science with clinical dentistry without reorganization of the curriculum.

Oral Diagnosis

By CHARLES F. BODECKER

ORAL diagnosis is one of the most recent additions to the dental curriculum. This field requires the clinical application of practically all the sciences. Some schools teach oral diagnosis in a separate department, while others follow the older procedure of splitting it into a number of phases, which are taught in the various clinical departments. With a separate department teaching the subject, students are given a complete picture of the necessary rehabilitation of the mouth of each patient, and as well all the oral conditions are discussed simultaneously. As it is possible to permit each student to diagnose approximately sixty or seventy cases under supervision, this training in the subject is highly effective. A separate department of oral diagnosis offers: (1) improvement in the quality of teaching, (2) aid in better interdigitation of the clinical departments, (3) a nucleus for research and (4) an opportunity to review the sciences and thus demonstrate their clinical applications. The article is discussed by six authorities in the field, who present both sides of the subject.

A Suggested State Licensing Examination in Oral Diagnosis, Roentgenographic Interpretation and Treatment Planning

By CHARLES F. BODECKER

THE author advocates giving these examinations as an additional test of candidates for state dental licensure. The examination is divided into three parts: (1) x-ray interpretation, (2) recommended fillings and other treatment and (3) prosthetic reconstructions. This examination is a modification of one given by the New Jersey State Board of Registration and Examination in Dentistry. The various pathologic conditions are given specific numbers, which the candidate enters on a special mouth chart. This method greatly simplifies the correction of the examination papers. The article is discussed by six consultants, university teachers interested particularly in oral diagnosis. Their statements add valuable information. —*J. D. Educ.*, 8:161, December 1943.

Examination in Oral Diagnosis as Presented by the New Jersey State Board of Registration and Examination in Dentistry

By GEORGE L. SNELL

THE author describes a method of giving state licensing examinations on the basis of articulated casts and full mouth x-ray films. Besides treatment planning and x-ray interpretation, the subject of oral pathology is treated in some detail by requiring candidates to diagnose various conditions in a number of projected colored lantern slides. The author believes that oral diagnosis is highly important. The experience of the New Jersey State Board is that some results of the examinations show a lack of diagnostic training in the average dental student.—*J. D. Educ.*, 8:174-176, December 1943.

Outline of Clinical Periodontia Instruction (Junior Year)

By S. SORRIN, J. WEISMAN and A. ROTHWEIN

IN the Junior Periodontia Clinic of the New York University College of Dentistry, periodontia departments in other schools are afforded the opportunity of studying the methods for mutual advantage. All well-known teaching methods are employed to give the students a clearer conception of this broad subject. It is important to correlate preclinical subjects with clinic material and to constantly quizz the students on this relationship. The periodontia department presents a fertile field for the furtherance of this study.—*J. D. Educ.*, 8:100-106, December 1943.

Observations Relative to the Therapeutic Value of Heavy Metals in Treating Vincent's Gingivitis

By WILLIAM E. LUDWICK

NINETEEN patients under treatment for syphilis with arsenical and bismuth compounds were observed clinically and by diagnostic laboratory procedures. Two patients had acute Vincent's gingivitis; five exhibited chronic symptoms; in four, a few Vincent's organisms were demonstrated, and

five had no organisms present. The most significant observations were made on two of the remaining three persons, who received in five days the arsenical equivalent of thirty-two weeks' treatment and yet daily showed Vincent's organisms. It was concluded that neither arsenical or bismuth compounds are uniformly efficacious in the treatment or prevention of Vincent's gingivitis.—*U. S. Navy M. Bull.*, 42:584, March 1944.

L. E. KURTH.

Tooth Buds in Patients with Congenital Syphilis

By WILLIAM H. BAUER

BECAUSE doubt as to the pathogenesis of the dental manifestations of congenital syphilis existed, Bauer published the histologic findings in six necropsied cases. While some investigators believed that injury to the developing tooth buds was secondary rickets, others (Hill, Schneider) had published evidence that *T. pallidum* invaded the tooth bud. Bauer has conclusively shown that the spirochete enters the tooth follicle, and multiplies particularly perivascularly and close to the enamel epithelium. As suggested by Schneider, the areas of greatest tissue damage were found where the spirochetes had disintegrated in large numbers. Injury to the ameloblasts resulted in enamel hypocalcification and hypoplasia.—*Am. J. Path.*, 20:297-320, March 1944.

WILLIAM F. BARNFIELD.

Quantitative Method for the Comparison of Craniofacial Patterns in Different Individuals: Its Application to a Study of Parents and Offspring

By W. L. WYLIE

A ROENTGENOGRAPHIC cephalometric method (Broadbent-Bolton) was employed for determination of various craniofacial angles. Intrafamilial relationships between facial patterns were studied in fifteen different families. So-called identical twins may show dissimilar craniofacial patterns, even though their outward similarity is marked. Correlations between various angles in any one complex are not predictable, and it is not possible to determine the pattern for one side of the face from that of the other.—*Am. J. Anat.*, 74:39, January 1944.

DAVID B. SCOTT.

Cranial Nerve Palsies with Herpes Following General Anesthesia

By J. H. HUMPHREY and M. MCCLELLAND

IN the thirteen cases of cranial nerve palsy following general anesthesia here presented, patients reported a sense of coldness, numbness or tightness around the lips, which later involved the whole distribution of the fifth nerve. Circumoral herpes was noted in most cases. Difficulty in swallowing was also noted. Three cases showed motor fifth-nerve weakness. Diplopia, facial weakness and tongue tremors were noted in some cases. In the milder cases, recovery was rapid (almost complete in a fortnight), while the more severe cases still presented the subjective changes after five months. Theories of etiology include toxicity of the anesthetics (ether, trichlorethylene and cyclopropane), artificial hyperthermia and virus infection.—*Brit. M. J.* 1:315, March 4, 1944.

DAVID B. SCOTT.

Hazards in the Use of the Closed-Circuit Technique for Trilene Anesthesia

By S. CARDEN

AMONG the advantages of trichlorethylene as a general anesthetic are non-inflammability and reduced risk of ventricular fibrillation. The administration technic generally involves carbon dioxide absorption and rebreathing. Certain dangers attend this closed-circuit method. Toxic oxidation products are formed by interaction of the trilene and the soda lime in the absorber. Reaction is catalyzed by the heat generated in the lime. Possible pathologic conditions resulting from the production of dichlorethylene are trigeminal and other types of cranial nerve palsy.—*Brit. M. J.*, 1:319, March 4, 1944.

DAVID B. SCOTT.

Nutritional Requirements of Syrian Hamster

By J. W. HAMILTON and A. G. HOGAN

A NORMAL rate of growth and maintenance of weight results from feeding of simplified rations. The vitamins needed in the simplest satisfactory diet are A, D, E, K, thiamine, riboflavin, pyridoxine, and pantothenic acid. Vitamin E omission results in collapse and

death in from four to eighteen weeks. Omission of vitamin K results in an irregular rate of growth, but maturity is reached in nearly normal time. During arrested growth periods, small hemorrhagic areas develop. If both vitamin E and viamin K are omitted, the animals die (owing to E deficiency), but also suffer severe hemorrhage. A high percentage of females bore at least one litter on diets containing the above-mentioned elements plus nicotinic acid, choline and inositol. It is not decided whether biotin or p-aminobenzoic acid is essential. Few animals bore a second litter, and it is concluded that the hamster requires at least one unrecognized vitamin for reproduction. —*J. Nutrition,* 27:213, March 10, 1944.

DAVID B. SCOTT.

Persistence of Influenza Virus on the Human Hand

By E. R. PARKER

POTENT virus of the Melbourne influenza strain may remain active in the dry state on the human hand for forty-five minutes. The application of soap solution tends to inactivate the virus. Manual transmission of influenza is a possibility and a menace.—*J. Lab. & Clin. Med.,* 29:121, February 1944.

DAVID B. SCOTT.

Effects on Rats of Prolonged Feeding with the Staple African Diet

By J. GILLMAN

SIGNIFICANT results of this feeding experiment were gross liver disease, lung lesions, enlargement of the heart, adiposity, thickening of the skull and dental affections. All conditions occurred without any recognizable acute vitamin deficiency states. The upper incisors were particularly affected. Many were fractured, some fused and others became loose. No explanation is offered as to the etiology.—*Brit. M. J.,* 1:149, January 29, 1944.

DAVID B. SCOTT.

Relationships Between Dental Caries and Saliva

By N. C. TURNER and E. M. CRANE

A RELATIONSHIP has been noted between the rate of starch hydrolysis by saliva and the incidence of caries. In fifty-one cases, individuals with extensive caries produced saliva which hydrolyzed starch very rapidly. Saliva from caries-free individuals hydrolyzed starch very slowly.—*Science,* 99:262, March 31, 1944.

DAVID B. SCOTT.

Bone Growth and Physiologic Tooth Movement

By H. SICHER and J. P. WEINMANN

To decide which is primary, alveolar bone growth or tooth movement, the authors made a study based on the gross and roentgenographic analysis of albino rat skulls together with ground and decalcified serial rat jaw sections. Observations and measurements were made on ground sections of animals that had received repeated alizarin injections. A brief description of the rat dentition is given together with a description of the jaw and tooth growth. All teeth erupt continually, the molars moving distally and slightly buccally at the same time. However, this distal drift, although lifelong, is intermittent. Examination of ground sections of teeth from animals that have been periodically injected with alizarin makes it possible to estimate the amount of weekly apposition of bone associated with the distal tooth drift. The rate established was about 60 to 80 micra weekly. Changes in the incisal region are more complicated. Despite the molar distal drift, the mesiodistal relation between the lower incisor and molars remains fairly constant, a fact indicating a distal drift of the incisor. The basal end of the upper incisor maintains a constant relation to the molars. The upper molars move occlusodistally and the basal end of the incisor shifts in the same direction. Growth in mandibular length was seen at the condyle and tip of the coronoid process. The body grew at the borders of the free alveolar process. The absolute growth of the maxilla in length is greater than that of the mandible. The maxillary height grows by bone apposition at the alveolar border.—*Am. J. Orthodontics,* 30:109, March 1944.

S. J. FANALE.

Cancer of the Lip: A Study of Fifty-Six Five-Year Cases

By C. A. WHITCOMB

CANCER of the lip is a slowly growing

squamous carcinoma of the exposed surface of the lip, generally occurring in older men. This lesion is relatively scarce in the upper lip or in women. About 25 per cent of lip cancers metastasize to cervical lymph nodes, and accurate prediction of probable metastasis is difficult. Death is caused by uncontrolled cervical metastases, not by the lip cancer itself. Treatment involves x-ray or radium therapy or surgical operations. Block dissection of cervical lymphatics is the method of choice in the presence of movable metastatic nodes. Cancer cells in lymph nodes can be destroyed by the combined effect of x-ray radiation and implantation of radon. The disease in the neck will be cured by this treatment only if no new metastatic nodes develop in the implanted area or elsewhere in the neck.—*Am. J. Surg.*, 63:304, March 1944.

S. J. FANALE.

Pemphigus Conjunctivae with Scarring of the Skin

By W. J. LEVER

THE three cases of pemphigus reported clearly show the three characteristic features distinguishing pemphigus conjunctivae from other forms of pemphigus: a chronic, benign course, a predilection of the lesions for the mucous membranes, particularly the conjunctivae, and a tendency toward scarring. The general health was unaffected, although the disease had already existed five, six and nine years, respectively. The conjunctivae and oral mucosa were involved in all three patients, the nasal mucosa in two and the mucosa of the glans penis in one. Scarring was seen in the mucosa of the conjunctiva and the oral and nasal cavities, but not in each case. Usually, the face and scalp showed the greatest involvement.—*Arch. Derm. & Syph.*, 49:113, February 1944.

S. J. FANALE.

Ludwig's Angina

By K. TSCHIASSNY

LUDWIG'S angina is characterized by a gangrenous cellulitis, originating in the submandibular space and rapidly spreading toward the floor of the oral cavity. Differential diagnosis should exclude isolated cellulitis of the floor of the mouth and of the submandibular space or suppurative submaxillary lymphadenitis. The latter is often given the name pseudo-Ludwig's angina. This study emphasizes the frequency of dental origin and the almost exclusive involvement of the molars. Anatomic studies of the relation of molar roots to the mylohyoid ridge showed that the roots of the second and third molars invariably reach as far as, or even below, the ridge, while the first molar root usually does not extend past the ridge. These findings explain the fact that an infection arising from a molar usually extends into the space below the mylohyoid muscle. A report of a necropsy in a case of Ludwig's angina showed perforation of the inner plate of the mandible below the mylohyoid ridge. Apparently, the primary infection originated from a carious second molar.—*Am. J. Orthodontics*, 30:133, March 1944.

S. J. FANALE.

Fluorine and Dental Health—Postwar Implications

By ALLEN O. GRUEBBEL

THE postwar objectives of public health dentistry should widen the distribution of dental care and improve technics for control of dental disease. Since the problem of dental caries will not be solved by health education and treatment service, introduction of non-toxic amounts of fluoride in domestic water supplies may be a practical and efficient method of markedly reducing its incidence.

Using estimates of the number of hours necessary to correct the dental deficits in children (6-14 years) in a community with no fluoride in the water supply, comparisons were made with the theoretical corrective needs of the expected benefit of the addition of fluoride obtained. Using LaClede County, Missouri, as an example, an estimate was made that, at present, four-fifths of the working time of the six dentists would be required to care for the dental needs of children the first year; whereas, if the county had a 1.2 parts per million fluoride water supply, only one-half the time would be necessary.—*Am. J. Pub. Health*, 34:244, March 1944.

PAUL H. KEYES.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ASSOCIATION OF INDUSTRIAL DENTISTS, St. Louis, Mo., May 11.

AMERICAN DENTAL ASSISTANTS ASSOCIATION, Omaha, Nebr., October 9-11.

AMERICAN DENTAL ASSOCIATION, Omaha, Nebr., October 9-11.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION, Omaha, Nebr., October 9-11.

AMERICAN DIETETIC ASSOCIATION, Chicago, Ill., October 25-27.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York, N. Y., October 3-5.

CLEVELAND DENTAL SOCIETY, May 8-10.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second Tuesday in each month, at the Medical Society Auditorium, Washington.

GREAT LAKES SOCIETY OF ORTHODONTISTS, Toledo, Ohio, October 23-24.

KANSAS STATE DENTAL ASSISTANTS' ASSOCIATION, Topeka, May 3-4.

UNIVERSITY OF MARYLAND DENTAL SCHOOL CLASS OF 1904, Baltimore, May 1-3.

MONTREAL DENTAL CLUB ANNUAL FALL CLINIC, October 25-27.

NATIONAL BOARD OF DENTAL EXAMINERS, May 1-2 and July 31-August 1.

NATIONAL DENTAL ASSOCIATION, Cleveland, Ohio, August 14-18.

GREATER NEW YORK DENTAL MEETING, December 4-8.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, November 13-14.

ONTARIO DENTAL ASSOCIATION, Toronto, Canada, May 29-31.

WESTERN RESERVE UNIVERSITY DENTAL ALUMNI ASSOCIATION, Cleveland, Ohio, May 10.

WOMEN'S DENTAL SOCIETY OF NEW YORK, New York, N. Y., May 17, September 20 and November 15.

STATE SOCIETIES

May

Arkansas, at Little Rock (22-24)

Connecticut, at New Haven (26-27)

Georgia, at Atlanta (7-10)

Illinois, at Springfield (8-11)

Indiana, at Indianapolis (15-17)

Kansas, at Topeka, (3-4)

Maryland, at Baltimore (1-2)

Missouri, at Jefferson City (1-3)

Montana, at Billings (4-6)

New Jersey, at Atlantic City (3-5)

New York, at Buffalo (9-12)

North Carolina, at Raleigh (1-3)

Tennessee, at Memphis (22-25)

June

Maine, at Augusta (16-17)

New Hampshire, at North Conway (25-27)

September

Southern California, at Los Angeles (19-21)

STATE BOARDS OF DENTAL EXAMINERS

Colorado, at Denver, June 19-24. Ezra E. Schaefer, 606 Republic Bldg., Denver, Colo.

Connecticut, at Hartford, June 20-24. Clarence G. Brooks, 320 State St., New London, Recorder.

Kentucky, at Louisville, September 12-15. W. F. Waltz, 1114 First Nat'l Bank Bldg., Lexington, Secretary.

New Jersey, June 26-30. J. Frank Burke, 150 E. State St., Trenton 8, Secretary.

North Carolina, at Raleigh, September 25. Wilbert Jackson, Rich Bldg., Clinton, Secretary.

North Dakota, at Fargo, July 10-13. R. A. Andrews, Carrington, Secretary.

Pennsylvania, at Philadelphia and Pittsburg, May 19-20 (dental hygiene) and June 6-10. Reuben E. V. Miller, 61 N. Third St., Easton, Secretary.

Vermont, at Montpelier, June 26-28. Charles I. Taggart, 139 Bank St., Burlington, Secretary.

West Virginia, at West Liberty, June 26-

28 (dental and dental hygiene). R. H. Davis, Goff Bldg., Clarksburg, Secretary.

Wisconsin, at Milwaukee, July 10-14. Stephen F. Donovan, Tomah, Secretary.

Wyoming, at Cheyenne, June 22-26. O. R. Docekal, Sheridan, Secretary.

AMERICAN ASSOCIATION OF INDUSTRIAL DENTISTS

THE American Association of Industrial Dentists will hold a conference on industrial dental health in Room 2, New Hotel Jefferson, St. Louis, Mo., 1 to 5 p.m., May 11. Every one interested in improving the dental health of industrial employes is invited to attend this meeting. Those who desire to participate actively in this conference are requested to notify the secretary of the association, stating their official and/or professional affiliations.

POWELL C. CARREL, *Secretary,*
75 Oxford St.,
Hartford 5, Conn.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

THE Twentieth Annual Session of the American Dental Assistants Association will be held in Omaha, Nebr., October 9-11. For further information, address

AILEEN M. FERGUSON,
General Secretary,
709 Centre St.,
Jamaica Plain, Mass.

AMERICAN DENTAL ASSOCIATION

THE next annual meeting of the House of Delegates of the American Dental Association will be held in Omaha, Nebr., October 9-11.

HARRY B. PINNEY, *Secretary,*
222 East Superior St.,
Chicago 11, Ill.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

THE twentieth annual meeting of the House of Delegates and the Board of Trustees of the American Dental Hygienists' Association will be held in Omaha, Nebr., October 9-11. Headquarters will be at the Hotel Fontenelle.

A. REBEKAH FISK, *Secretary,*
1704 North Troy St.,
Arlington, Va.

AMERICAN DENTAL SOCIETY OF EUROPE

THE available members of the Executive Committee and officers, viz. J. A. Holden, H. S. Hargreaves (formerly of Paris), C. W. Roberts, R. N. LeCron, Sidney McCallin, W. A. Porter, W. H. McNally, M. H. G. Sturridge and K. C. Campbell, met January 21 in London, under the chairmanship of the president, Dr. Holden, to discuss the future plans of the society. It was decided to hold a "get-together" dinner of all the members now residing in Great Britain some time during the summer.

K. C. CAMPBELL,
Honorable Secretary,
88 Portland Place,
London, W. 1.

AMERICAN DIETETIC ASSOCIATION

THE annual meeting of the American Dietetic Association will be held at the Palmer House, Chicago, Ill., October 25-27. The sessions will be devoted to discussion of plans and problems relating to food and nutrition in connection with the war. Topics will include progress of the acceleration program to increase the number of qualified dietitians; improvement in methods in teaching student nurses; recruitment of dietitians for the Army; administrative food problems; newer developments in diet therapy; maternal and child nutrition; school lunch problems; rationing and food supplies; labor policies in food service units, and technology of foods. There will also be discussions of postwar plans and the extent to which the association and its members can participate. Details of the program will be released as they develop.

AMERICAN PUBLIC HEALTH ASSOCIATION

THE Executive Board of the American Public Health Association announces the Second Wartime Public Health Conference and the seventy-third annual business meeting in New York, N. Y., October 3-5. Meetings of related organizations will take place October 2. Headquarters, Hotel Pennsylvania. The scientific program will be devoted to wartime emergency matters as they affect public health. The chairman of the Local Committee in Charge of Arrangements is Ernest L. Stebbins, M.D., health

commissioner of New York City. The chairman of the program committee is Reginald M. Atwater, M.D.

WILLIMINA RAYNE WALSH,
Associate Secretary,
1790 Broadway,
New York 19, N. Y.

CLEVELAND DENTAL SOCIETY ANNUAL SPRING CLINIC MEETING

THE Annual Spring Clinic Meeting of the Cleveland Dental Society will be held at the Hotel Carter, May 8-10.

H. C. ALEXANDER,
Windermere Theatre Bldg.,
East Cleveland, Ohio.

DISTRICT OF COLUMBIA DENTAL SOCIETY

THE District of Columbia Dental Society holds its meetings on the second Tuesday of every month, at the Medical Society Auditorium, 1718 M. St., N.W., Washington.

J. WALTER BERNHARD, *Secretary,*
1835 Eye St., N.W.,
Washington.

GREAT LAKES SOCIETY OF ORTHODONTISTS

THE next meeting of the Great Lakes Society of Orthodontists will be held October 23-24 at the Commodore Perry Hotel, Toledo, Ohio.

C. EDWARD MARTINEK, *Secretary,*
661 Fisher Bldg.,
Rochester, N. Y.

KANSAS STATE DENTAL ASSISTANTS' ASSOCIATION

THE annual meeting of the Kansas State Dental Assistants' Association will be held at the Jayhawk Hotel, Topeka, May 3-4.

ROBERTA GAWTHROP, *Secretary.*

UNIVERSITY OF MARYLAND DENTAL SCHOOL CLASS OF 1904

A REUNION of the Class of 1904, Dental School, University of Maryland, to celebrate its fortieth anniversary will be held during the annual meeting of the Maryland State Dental Association, May 1-3, in Baltimore at the Belvedere Hotel. For further information, address

WALTER E. GREEN, *Secretary,*
2958 W. North Ave.,
Baltimore.

MONTREAL DENTAL CLUB ANNUAL FALL CLINIC

THE twentieth anniversary meeting of the Montreal Dental Club Annual Fall Clinic will be held October 25-27 at the Mount Royal Hotel, Montreal. For further information, apply to

M. L. DONIGAN, *Director,*
Drummond Medical Bldg.,
Montreal, Canada.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next two sessions for the examination of canidates in Parts 1 and 2, May 1-2 and July 31-August 1 in schools where there are five or more candidates. For further information, address

GORDON L. TEALL, *Secretary,*
Box 71,
Hiawatha, Kan.

NATIONAL DENTAL ASSOCIATION

THE National Dental Association will hold its thirtieth annual session August 14-18 at the New Central High School, Cleveland, Ohio. For further information, address

J. A. JACKSON, *Secretary,*
Charlottesville, Va.

GREATER NEW YORK DENTAL MEETING

THE Greater New York Dental Meeting will be held at the Hotel Pennsylvania, New York, December 4-8.

WILLARD S. BELL, *Chairman,*
Press and Publication Committee,
Room 106A, Hotel Pennsylvania,
New York.

NEW YORK SOCIETY OF ORTHODONTISTS

THE next meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, November 13-14.

NORMAN L. HILLYER, *Secretary,*
Professional Bldg.,
Hempstead.

ONTARIO DENTAL ASSOCIATION

THE Seventy-Seventh Annual Convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, May

29-31. Dentists from the United States and all parts of Canada will be welcome.

EDMUND A. GRANT, *Secretary,*
86 Bloor St. West,
Toronto, Canada.

WESTERN RESERVE UNIVERSITY DENTAL ALUMNI ASSOCIATION

THE Western Reserve University Dental Alumni Association will hold its annual reunion and dinner Tuesday evening, May 10, at the Hotel Carter, Cleveland, Ohio.

SHELDON H. FRANZ,
Rose Bldg.,
Cleveland, Ohio.

WOMEN'S DENTAL SOCIETY OF NEW YORK

THE next meeting of the Women's Dental Society of New York will be held May 17 at the Pennsylvania Hotel at 8 p.m. Carlton Frederichs will speak on "Victuals, Vitamins and Victory."

MATHILDE FREUND, *Chairman,*
Publicity Committee,
Scarsdale.

ARKANSAS STATE DENTAL ASSOCIATION

THE Arkansas State Dental Association will hold its next annual meeting at the Marion Hotel, Little Rock, May 22-24.

I. M. STERNBERG, *Secretary.*

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

THE annual meeting of the Southern California State Dental Association will be held at the Biltmore Hotel, Los Angeles, September 19-21.

ROBERT L. BORLAND, *Secretary,*
756 S. Broadway,
Los Angeles 14.

CONNECTICUT STATE DENTAL ASSOCIATION

THE Eightieth Annual Meeting of the Connecticut State Dental Association will be held at the Hotel Taft, New Haven, May 26-27.

EARLE S. ARNOLD, *Secretary,*
37 Linnard Road,
West Hartford 7.

GEORGIA DENTAL ASSOCIATION

THE seventy-sixth annual meeting of the Georgia Dental Association will be held in Atlanta, May 7-10, with headquarters at the Ansley Hotel.

R. H. MURPHY, *Secretary,*
605 Bankers Insurance Bldg.,
Macon.

ILLINOIS STATE DENTAL SOCIETY

THE next meeting of the Illinois State Dental Society will be held in Springfield, May 8-11.

L. H. JACOB, *Secretary,*
Jefferson Bldg.,
Peoria 2.

INDIANA STATE DENTAL ASSOCIATION

THE eighty-seventh annual session of the Indiana State Dental Association will be held May 15-17 at the Claypool Hotel, Indianapolis.

E. E. EWBANK, *Secretary,*
Kingman.

KANSAS STATE DENTAL ASSOCIATION

THE Seventy-Third Annual Session of the Kansas State Dental Association will be held at the Hotel Kansan, Topeka, May 3-4.

FRED A. RICHMOND, *Secretary,*
Huron Bldg.,
Kansas City.

MAINE DENTAL SOCIETY

THE next annual meeting of the Maine Dental Association will be held June 16-17 at the State House, Augusta.

LAURENCE G. HIGGINS,
Ellsworth.

MARYLAND STATE DENTAL ASSOCIATION

THE Sixty-First Annual Meeting of the Maryland State Dental Association will be held in Baltimore, May 1-2, at the Belvedere Hotel.

PAUL A. DEEMS, *Secretary,*
835 Park Ave.,
Baltimore.

MISSOURI STATE DENTAL ASSOCIATION

THE next meeting of the Missouri State Dental Association will be held at Jefferson City, May 1-3, at the Governor Hotel.

C. W. DIGGES, *Secretary,*
Exchange National Bank Bldg.,
Columbia.

MONTANA STATE DENTAL ASSOCIATION

THE 1944 meeting of the Montana State Dental Association will be held at Billings, May 4-6.

T. T. RIDER, *Secretary,*
9 Higgins Block,
Missoula.

NEW HAMPSHIRE DENTAL SOCIETY

THE next meeting of the New Hampshire Dental Society will be held June 25-27 at the Eastern Slope Inn, North Conway.

F. E. WILLIAMS, *Secretary,*
814 Elm St.,
Manchester.

NEW JERSEY STATE DENTAL SOCIETY

THE New Jersey State Dental Society will hold its seventy-fourth annual meeting May 3-5 at the Claridge Hotel, Atlantic City.

F. K. HEAZELTON, *Secretary,*
223 E. Hanover St.,
Trenton 8.

DENTAL SOCIETY OF THE STATE OF NEW YORK

THE seventy-sixth annual meeting of the Dental Society of the State of New York will be held in the Hotel Statler, Buffalo, May 9-12. In conjunction with the meeting, there will be suitable exercises commemorating the centennial of the discovery of the use of nitrous oxide in surgical procedures. Arthur H. Merritt, Past President of the American Dental Association and a member of the Horace G. Wells Centenary Committee, will give an address on "Horace G. Wells—Discoverer of Surgical Anesthesia." The scientific program will include eight essays, ten registered clinics, six postgraduate courses, six topic discussions and thirty table clinics. Lieut. Cmdr. F. E. Frates (DC), USN, will talk on "The South Pacific as Reflected in a Mouth Mirror." Capt. C. Raymond Wells (DC), USNR, and President of the American Dental Association, will participate May 12 in the outdoor public presentation to the armed services of a medium size tank and a mobile dental laboratory unit. The latter is of the newest type of movable war equipment sanctioned for use in the combat areas overseas. Until the development of this ten-wheeler, service men in need of dentures or of denture repair had to be evacuated to some fixed installation in the rear where laboratory facilities were available. The new mobile laboratory can get to the area where the fighting is heaviest and thus will greatly contribute to the war effort. Both of these contributions were made possible by the energetic campaign of the Scrap and Salvage Committee, Carl Sachse, chairman. In keeping with the desire of the society to avoid taxing the manpower and facilities of the hotel, the party, May 11, honoring the president, Leon Abbey, of Schenectady, will be simple. Because of the added demands upon railroad transportation, early roundtrip reservations are advised.

CHARLES A. WILKIE, *Secretary,*
1 Hanson Place,
Brooklyn 17.

NORTH CAROLINA DENTAL SOCIETY

THE Seventieth Annual Meeting of the North Carolina Dental Society will be held at the Hotel Sir Walter, Raleigh, May 1-3.

E. M. MEDLIN, *Secretary,*
Aberdeen.

TENNESSEE STATE DENTAL ASSOCIATION

THE next annual meeting of the Tennessee State Dental Association will be held at the Hotel Peabody, Memphis, May 22-25.

E. JEFF JUSTIS, *Secretary,*
1504 Exchange Bldg.,
Memphis.

COLORADO STATE BOARD OF DENTAL EXAMINERS

THE Colorado State Board of Dental Examiners will hold its next examination in Denver June 19-24. All credentials and fees must be filed with the secretary at least two weeks before the examination.

EZRA E. SCHAEFER, *Secretary,*
606 Republic Bldg.,
Denver.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford, June 20-24, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

CLARENCE G. BROOKS, *Recorder,*
302 State St.,
New London.

KENTUCKY STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Kentucky State Board of Dental Examiners will be held September 12-15 at the University of Louisville Dental School, Louisville. Dentists graduated prior to 1944 must file applications, complete with full information requested, at this office not later than July 12. Applications of 1944 graduates must be in this office by August 12. Dental hygienists must have completed a two-year course and their applications must be filed before August 12. For application forms and further information, address

W. F. WALTZ, *Secretary,*
1114 First Nat'l Bank Bldg.,
Lexington.

STATE OF NEW JERSEY BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its next regular examinations commencing June 26 and continuing for four days. On application to the secretary, a copy of the requirements and rules, instruction sheet and preliminary application will be sent. Candidates must file preliminary application blank, together with the fee of $25, on or before April 1. Future schedules will be announced.

J. FRANK BURKE, *Acting Secretary,*
150 E. State St.,
Trenton 8.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the North Carolina State Board of Dental Examiners for the examination of applicants for licensure will be held at the State Capitol, Raleigh, beginning September 25. Applications must be filed with the secretary thirty days before the examination. For application blanks and further information, address

WILBERT JACKSON, *Secretary,*
Rich Bldg.,
Clinton.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE North Dakota State Board of Dental Examiners will hold its next examination at the Gardner Hotel, Fargo, July 10-13. Applications should be in the hands of the secretary ten days earlier. For further information and application, address

R. A. ANDREWS, *Secretary,*
Carrington.

DENTAL COUNCIL AND EXAMINING BOARD OF THE COMMONWEALTH OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will meet in Philadelphia and Pittsburgh, May 19-20, to examine dental hygiene applicants. Applicants for licensure to practice dentistry will be examined in Philadelphia and Pittsburgh, June 6-10. For further information and application blanks, address the Department of Public Instruction, Bureau of Professional Licensing, Dental Division, Harrisburg.

REUBEN E. V. MILLER, *Secretary,*
61 N. Third St.,
Easton.

STATE OF VERMONT BOARD OF DENTAL EXAMINERS

THE Vermont State Board of Dental Examiners will meet at the State House, Montpelier, June 26-28, for the purpose of examining candidates for license to practice in the State of Vermont. Address all inquiries to

CHARLES I. TAGGART, *Secretary,*
139 Bank St.,
Burlington.

WEST VIRGINIA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the West Virginia State Board of Dental Examiners will be held at West Liberty State College, West Liberty, June 26-28. Examinations for licensure of dentists and dental hygienists will be held. All applications must be in the office of the secretary by June 16.

R. H. DAVIS, *Secretary,*
Goff Bldg.,
Clarksburg.

WISCONSIN STATE BOARD OF DENTAL EXAMINERS

THE Wisconsin State Board of Dental Examiners will hold its next examination July 10-14 at Marquette Dental School, Milwaukee, for licensure in dentistry or dental hy-

giene. For applications and other information, address

STEPHEN F. DONOVAN, *Secretary*,
Tomah.

WYOMING STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Wyoming Board of Dental Examiners will be held in Cheyenne June 22-26. All applications are required to be in the hands of the secretary two weeks prior to the meeting of the board.

O. R. DOCEKAL, *Secretary*,
Sheridan.

ALPHA OMEGA

ALL Massachusetts members of Alpha Omega in service, both in this country and abroad, are requested to communicate with Abraham Gurvitz, War Service Committee, Alpha Omega Fraternity, 371 Commonwealth Ave., Boston 15, Mass.

SAMUEL S. HIRSON, *Secretary*,
Boston Alumni Chapter,
471 Commonwealth Ave.,
Boston, Mass.

PAN AMERICAN ODONTOLOGICAL ASSOCIATION SCHOLARSHIP

THE Pan American Odontological Association takes pleasure in announcing an annual scholarship at the Tufts College Dental School, Boston, Mass., for graduate dentists from any of the Latin American countries. The subjects of study include: complete denture prosthesis, partial denture prosthesis, minor oral surgery, operative dentistry, ceramics, children's dentistry, root surgery and radiology, preventive dentistry and treatment of parodontal diseases.

This annual scholarship is an addition to the already available Pan American Odontological Association scholarships at the New York University, College of Dentistry; Evans Dental Institute, School of Dentistry, University of Pennsylvania, and the W. K. Kellogg Foundation Institute, Graduate and Postgraduate Dentistry, University of Michigan.

RALPH HOWARD BRODSKY, D.M.D.,
Executive Secretary,
14 East 81st St.,
New York 28, N. Y.

INTERNSHIP AND VOLUNTEER EXTERNSHIPS

THERE is an internship, as well as several volunteer externships, available for recent graduates in the Dental Department of the Bronx Hospital. Opportunity is offered for training and experience in oral surgery and exodontia, orthodontia, periodontia, endodontia (root-canal therapy) and operative dentistry. Application forms can be obtained by communicating with S. Berton Gerstner, Director, Dental Department, Bronx Hospital, Fulton Ave. at 169th St., Bronx 56, N. Y.

DENTAL INTERNSHIPS

Two internships are available at the St. Louis City Hospital for recent dental graduates. Opportunity is afforded for training and experience in dental and oral surgery, diagnosis and other phases of dentistry. Applicants should address Leo J. Wade, Medical Director, or Hamilton B. G. Robinson, D.D.S., City Hospital, 1515 Lafayette Ave., St. Louis, Mo.

DENTAL INTERNSHIPS

THE Greater New York Conference of Hospital Dental Services, comprised of a group of men who are chiefs of dental services, would like to aid those men seeking dental internships in hospitals in the metropolitan area. Those who are not in the Army or the Navy and who are desirous of obtaining internships should communicate with

MARY E. REILLY, *Secretary*,
386 Fourth Ave.,
New York, N. Y.

DENTAL INTERNSHIP

AN internship is available to a recent dental graduate at the Research and Educational Hospital of the University of Illinois Medical Center. An unusual opportunity is afforded for training and experience in hospital dentistry and the medical aspects of dental disease. Application forms can be obtained from the Dean, University of Illinois College of Dentistry, 808 South Wood St., Chicago 12, Ill.

DENTAL EXTERNSHIPS

VOLUNTEER dental externships are available in the Research and Educational Hospital to dental practitioners desiring training and experience in hospital dentistry, dentistry for children and the dental aspects of systemic disease. Application forms can be obtained from the Dean, University of

Illinois College of Dentistry, 808 South Wood St., Chicago 12, Ill.

UNIVERSITY OF CALIFORNIA RESEARCH ASSISTANT

THE College of Dentistry, University of California has an appointment as research assistant available for a qualified person beginning June 30. The appointment is in the Division of Dental Medicine and is for one year. This may be extended for an additional year.

This appointment is designed primarily for dental graduates with an interest in dental research and teaching. However, this dental degree requirement can be waived if other qualifications justify it.

The basic salary is $1,500 a year, plus an emergency increase to care for added living costs.

Application forms can be obtained from the Dean of the College of Dentistry, University of California, San Francisco, Calif.

WILLARD C. FLEMING, *Dean.*

UNIVERSITY OF ILLINOIS RESEARCH FELLOWSHIP

APPLICATIONS for Research Fellowships in Medicine, Dentistry and Pharmacy in the University of Illinois are now being considered for the year beginning September 1, 1944. Appointments to these Fellowships will be announced January 1.

Candidates for these Fellowships must have completed a training of not less than eight years beyond high school graduation. The Fellowship carries a stipend of $1,200 per calendar year with one month's vacation.

Application blanks and further information can be secured from the secretary of the Committee on Graduate Work in Medicine, Dentistry and Pharmacy, 1853 West Polk St., Chicago 12, Ill.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation of the New York and the Eastman Dental Clinic, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Fellow in Dentistry and, according to his interests, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduates Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean,*
Rochester, N. Y.

OHIO STATE UNIVERSITY POSTGRADUATE COURSES IN DENTISTRY

THE College of Dentistry of the Ohio State University, at Columbus, offers postgraduate courses in dentistry that are especially designed for the general practitioner who may wish to amplify his training in any of the following fields: oral surgery, prosthodontia, radiology, crown and bridgework, operative dentistry and root-canal therapy. The length and dates of the courses are as follows:

Oral surgery	June 12 to 16
Prosthodontia	June 12 to 17
Crown and bridge	June 12 to 16
Operative dentistry	June 12 to 16
Root canal therapy	June 12 to 16
Radiology	June 19 to 23

The fees for these courses will be $50 a week, with the registration limited to ten in each course, with the exception of prosthodontia, which will be $100 for the week's course, with registration limited to five.

It is the aim of these courses to teach new technics as well as to review the fundamentals. Further information and application blanks can be secured from the office of the dean, College of Dentistry, Ohio State University, Columbus.

FEDERAL POSITIONS FOR DENTAL HYGIENISTS

THE United States Civil Service Commission is continuing to recruit dental hygienists for federal positions. Experience is no longer necessary.

Completion of a full course leading to graduation from a recognized school of oral hygiene and registration as a dental or oral hygienist in a state, territory or the District of Columbia will qualify applicants. Students enrolled in schools of oral hygiene may apply for federal positions when they are within nine months of completion of the course and may enter on duty on completion and registration. There are no age limits for the positions and no written tests. Appointees receive $1,970 a year entrance salary, which incorporates compensation for the eight hours of overtime included in the present forty-eight hour federal work week. The majority of positions are in Army hospitals and dispensaries throughout the country, particularly in the West and Southwest. Vacancies may occur also in the Veterans Administration and the Public Health Service. Applications should be filed with the Civil Service Commission, Washington, 25, D. C.

W. C. HULL, *Executive Assistant,*
United States Civil Service Commission,
Washington, D. C.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING FEBRUARY 1944

February 1

2,340,715, WILMER P. UHLER. Dental equipment assemblages.

February 8

2,341,153, SIMON MYERSON. Tooth holder.

2,341,154, SIMON MYERSON. Temporary support for artificial teeth.

2,341,155, SIMON MYERSON. Impression tray and method of making dentures.

2,341,156, SIMON MYERSON. Temporary support for teeth.

2,341,465, EDWARD L. MONNOT. Two-way clamp lock for dental chair backs and the like.

D-137,249, HAROLD M. GROFF. Design for a fountain toothbrush.

February 15

2,341,555, HARRY JOHN JONES. Extrusion device.

2,341,593, MAX BURKHARDT. Composition for the production of prosthesis.

2,341,604, ISRAEL JOHN DRESCH. Base blank for dentures.

2,341,991, JOHN A. JACKSON. Injecting mechanism for dental flasks.

2,341,998, PYUNGTOO WILLIAM LEE and CHARLES DIETZ. All ceramic denture and method of producing same.

February 22

2,342,602, HJALMAR REITZ, JR. Anesthetic apparatus.

February 29

2,342,833, DENIS BORGEAT. Rotary toothbrush.

2,343,231, HENRY ALFRED ERNEST TALLEY. Anesthetic administration apparatus.